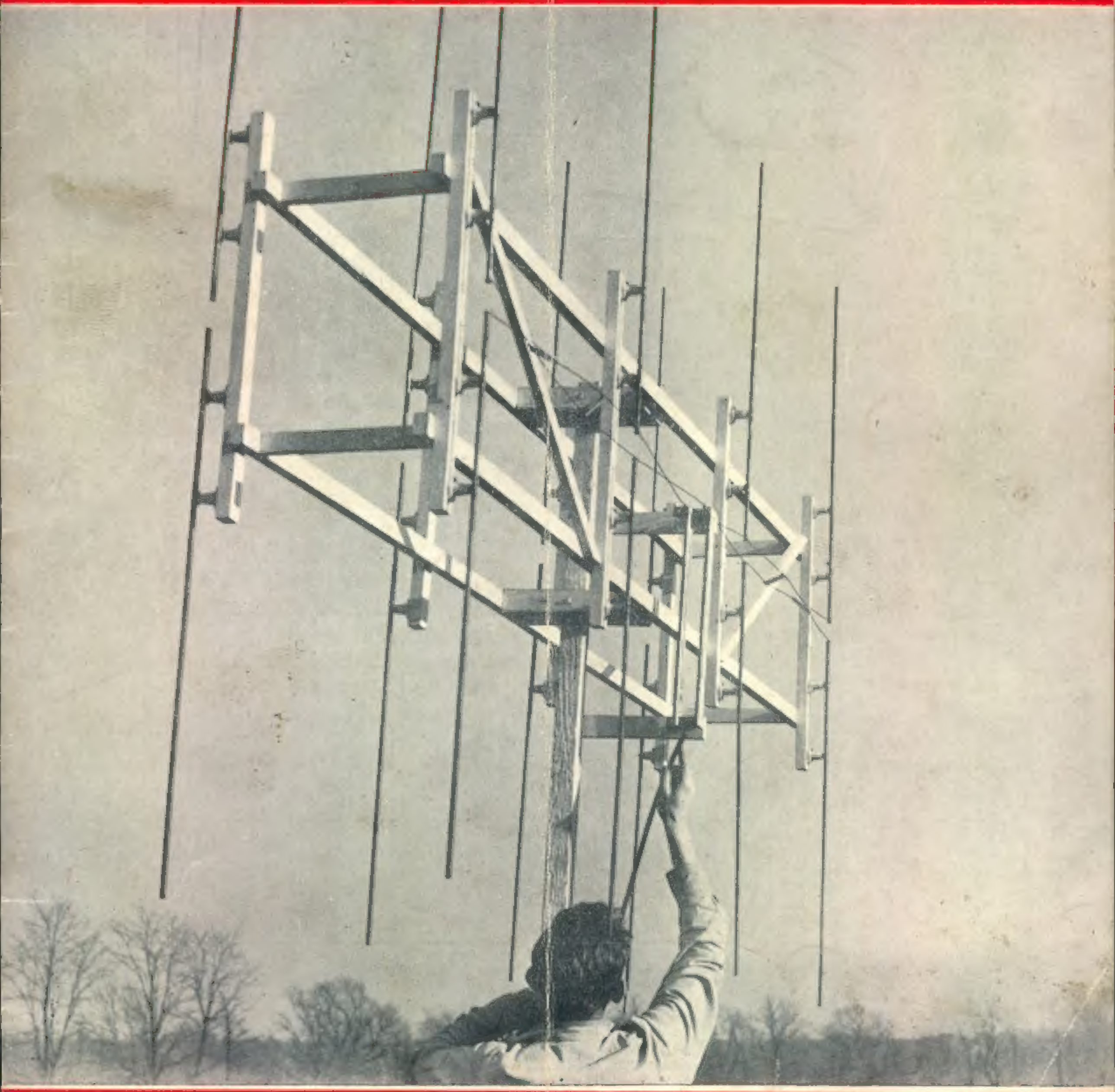
CQ

OCTOBER, 1946

The Radio Amateurs' Journal

25¢



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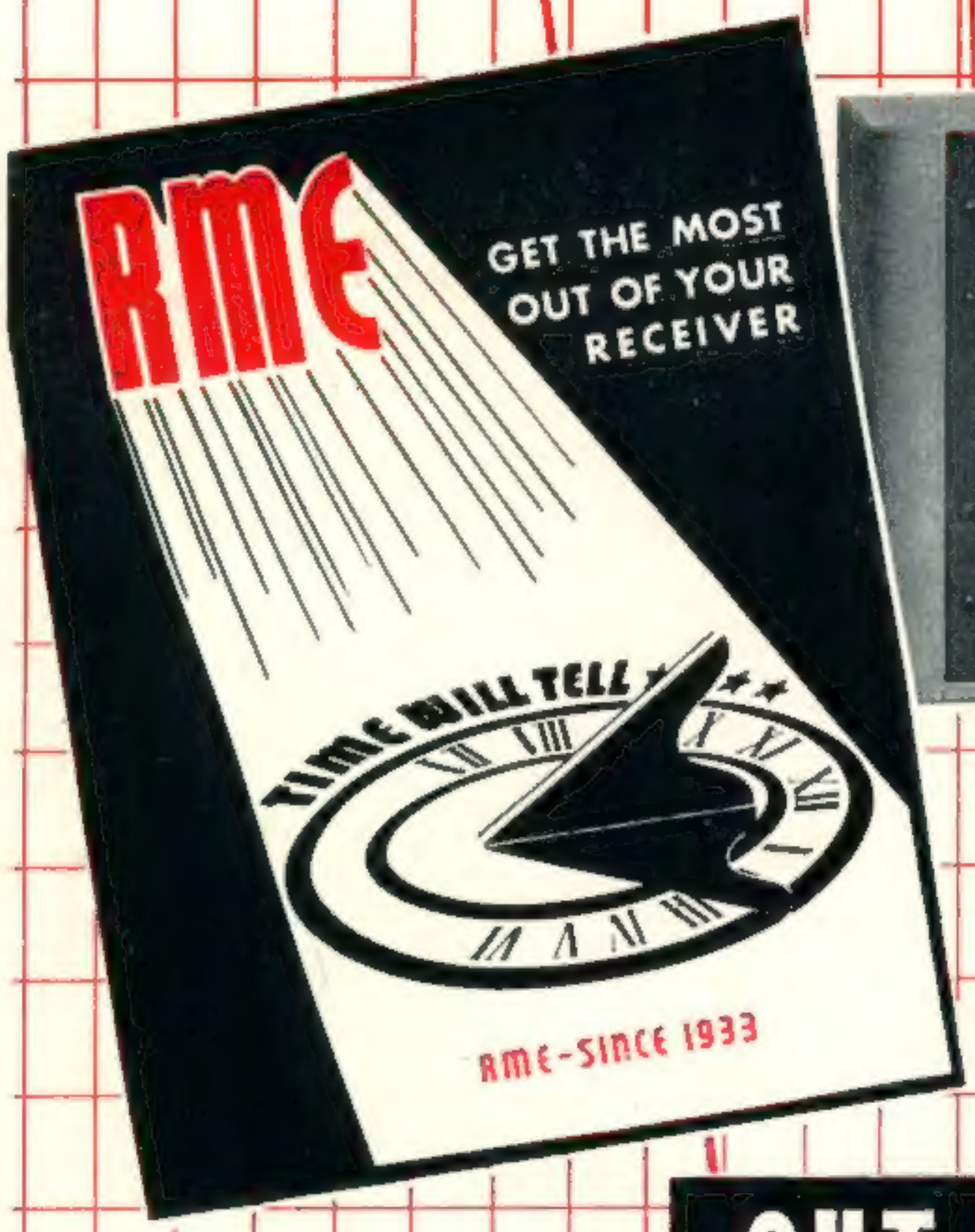

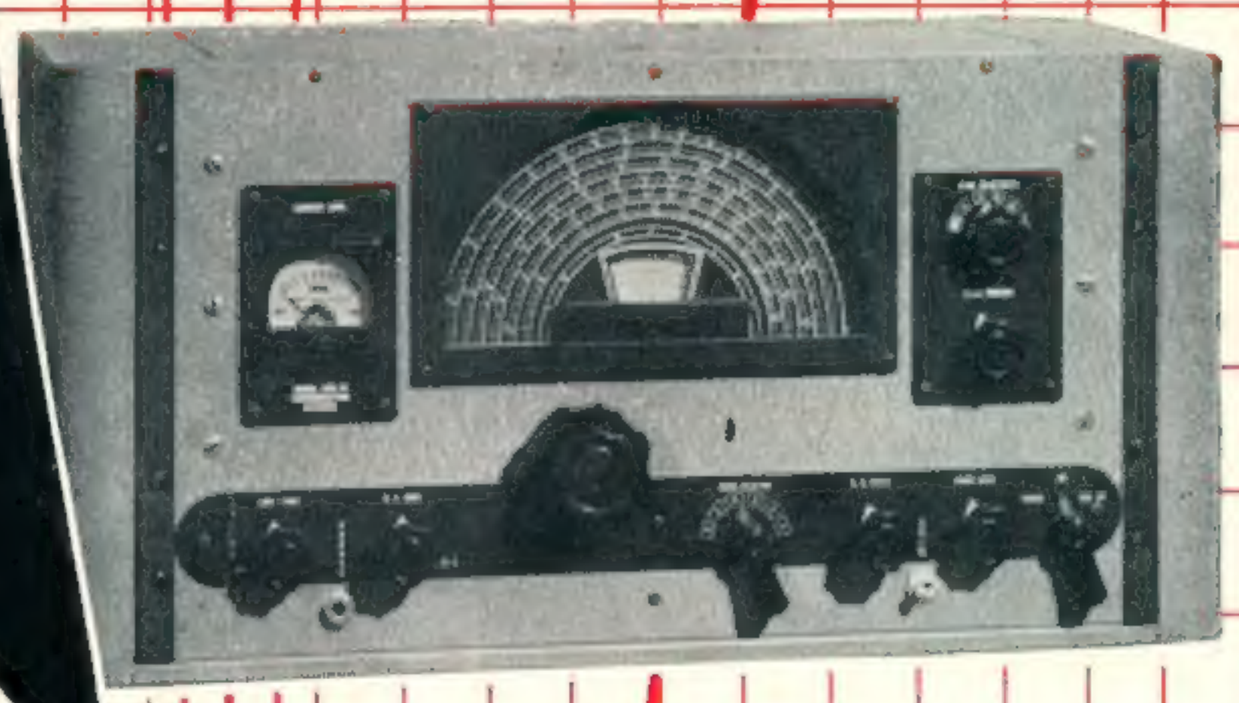

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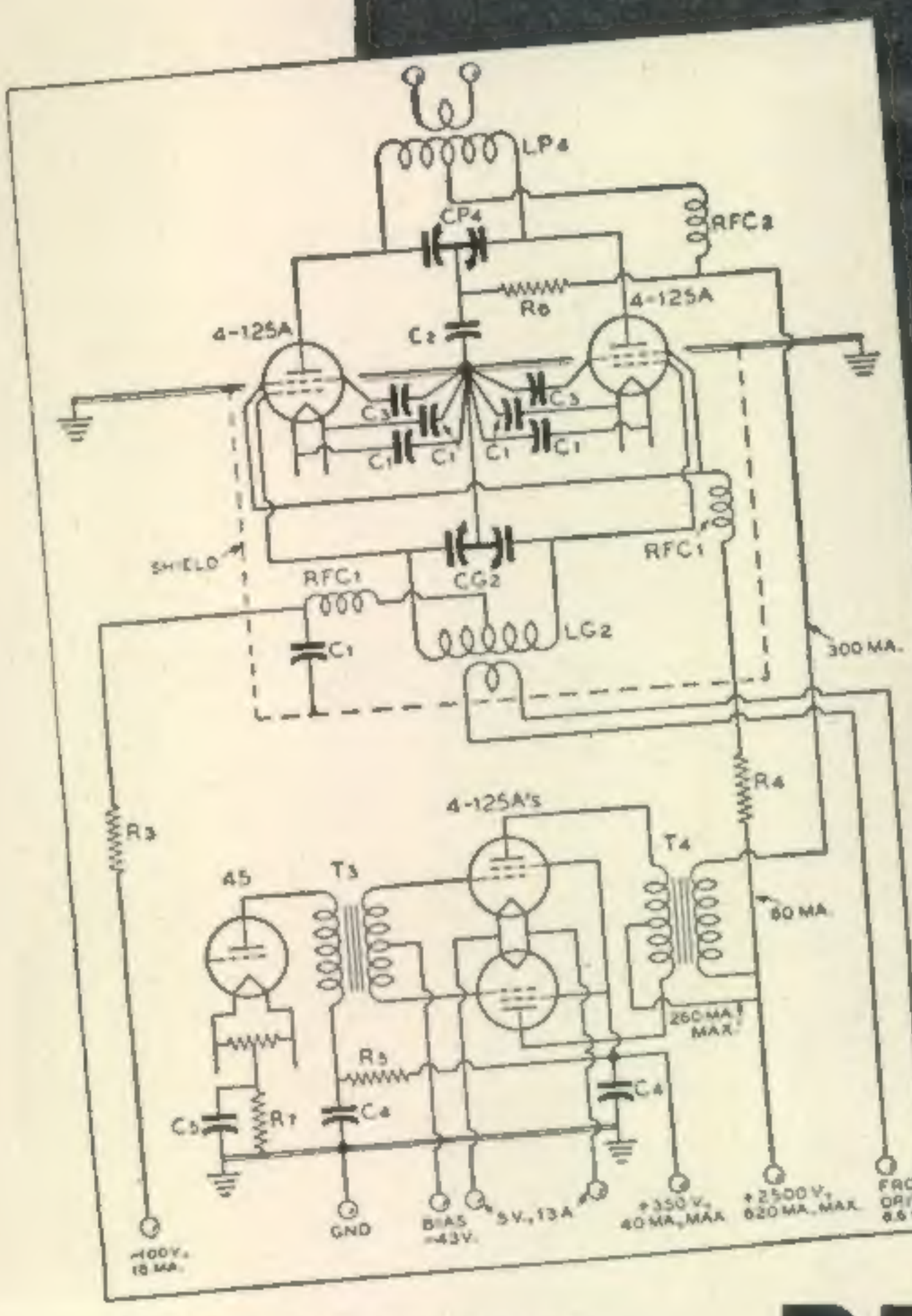

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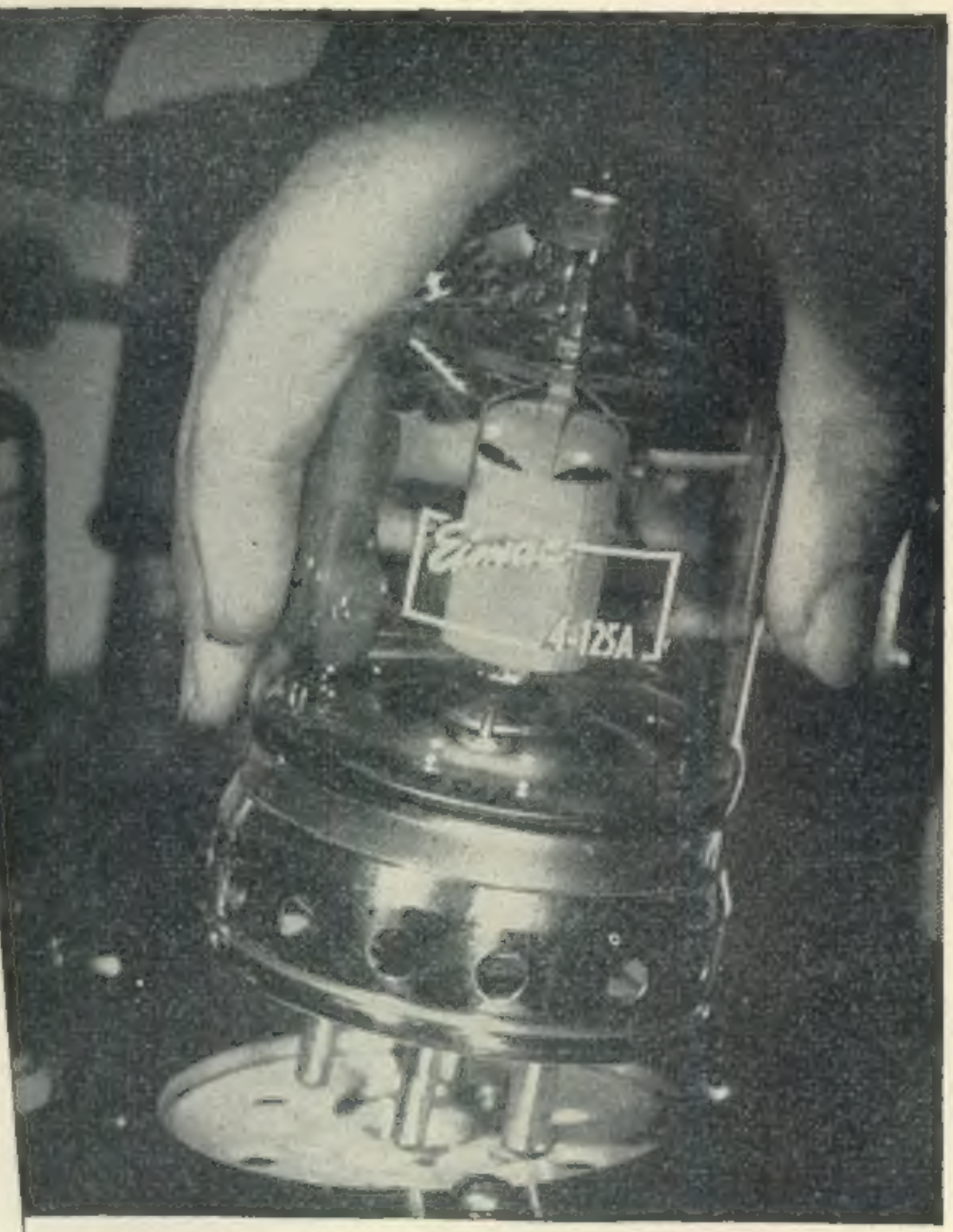

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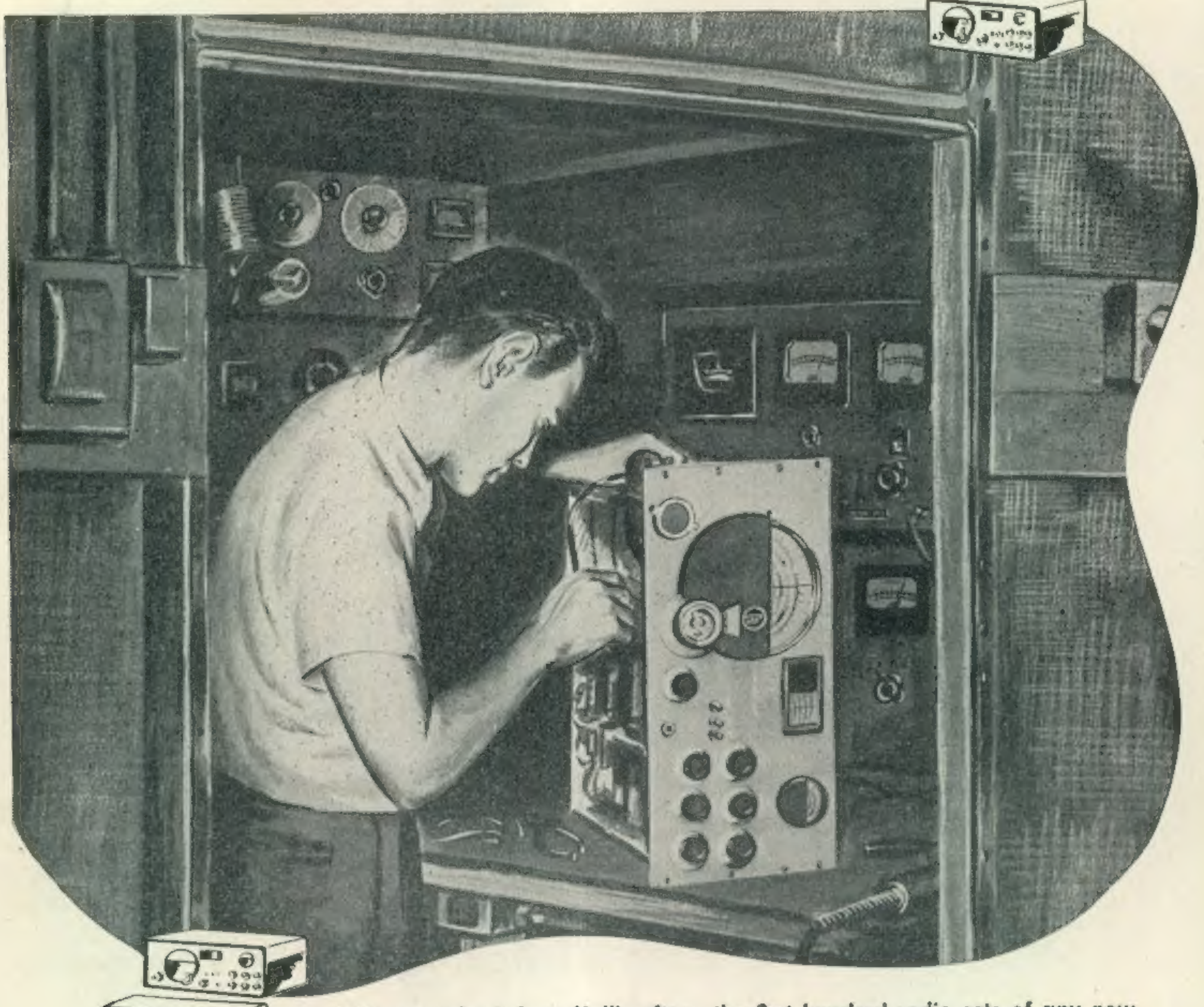

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CQ The Radio Amateurs' Journal

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Vol. 2 No. 10 OCTOBER, 1946

COVER

Holder of the 2-meter DX record, W3HWN adjusts the 16-element beam that made it possible. A description of the array starts on page 11.

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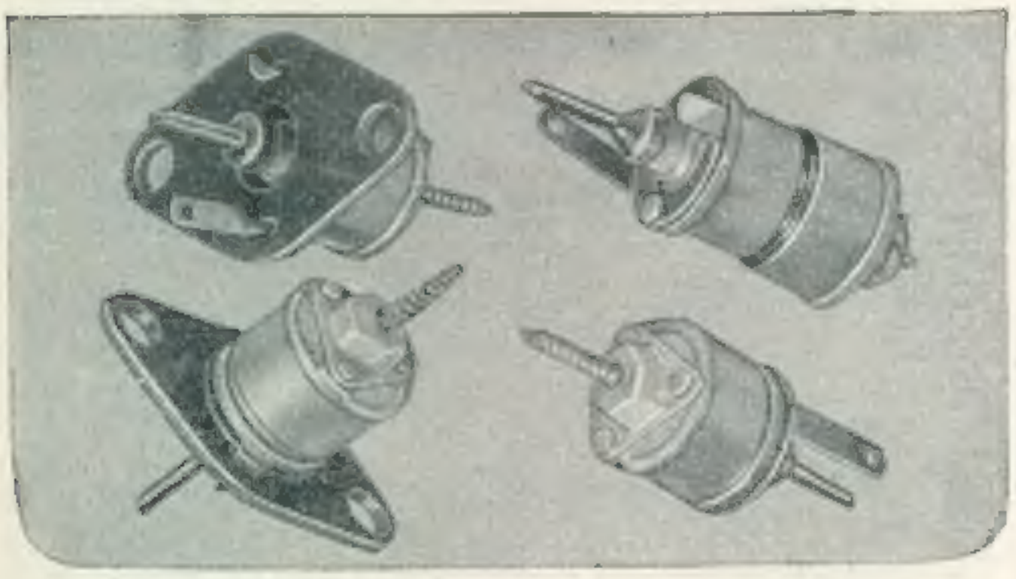

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. . . Zero Bias . . .

C.W.-Phone Subdivisions

At the risk of sounding repetitious we would like to talk about phone and c-w subdivisions of our bands, a subject already discussed in previous editorials. During the past month it has been our good fortune to find a few extra hours to pound brass and even talk into a microphone. The uneasy realization that c-w operation was becoming handicapped to a tremendous degree by foreign phone stations operating outside U.S. phone assignments became more apparent daily. This holds true on all bands open today. Foreign phone QRM was almost as much a problem of 3.5 and 7 mc, as it was on 14 mc. Bad enough that these phones were operating within our c-w bands, but many of them were of questionable technical character, modulating several hundred per cent it seemed at times.

In last month's editorial we were speculating on phone DX stations operating just outside the U.S. assignment, a practice that we agree is necessary if anyone on phone is to work DX. Now it appears that this argument isn't even valid—phones are working all over the c-w band and just outside the c-w edge, which has for years been the happy hunting ground for c-w DX. It is a condition which cannot go unrectified. It is breeding dissension within amateur ranks. The old phone versus c.w. controversy that came in for some good-natured jesting may develop into a nasty situation, and not without reason. No reasonable phone man wants all the c-w frequencies, any more than any rational c-w man wants all the phone frequencies. Nevertheless every day we get closer to an intolerable situation where one form of transmission, c.w., is subservient to another, through no fault of its own.

For years we have operated c.w. almost exclusively, but we want to go on record right now that if the situation were reversed we would be just as adamant about any selfish encroachment on phone frequencies by c-w stations. The situation has already reached a point where certain Latin American stations are talking about circulating a petition to request the FCC not to return remaining frequencies to the W's, in order to protect their (the Latin American's) ability to work each other without undue U.S. QRM.

Lest this degenerate into a fight between c.w. and phone factions in amateur radio, now is the time to seek a mutually satisfactory understanding. We ask for division of our frequencies on a basis determined by the percentage of amateurs using each type of transmission. But this division must include foreign stations as well. Cuban phone stations, for example, who are certainly entitled to work and enjoy amateur radio as much as any W, cannot be ignored when they occupy a good percentage of the U.S. c-w band. If they hugged the U.S. phone band or worked outside the phone edge of the band exclusively, it wouldn't be nearly as objectionable. The answer lies in international agreement on these points, or a concentrated drive by Americans to equalize frequency sharing including the portion of the bands taken up by foreign stations close enough to the U.S. to be considered "local."

When the remainder of the international bands open we can look for no improvement in the situation. If foreign phones occupy 50 or more kc of the c-w portion now, they will occupy it then, only perhaps in not quite so obvious a spot. W's are powerless to do anything about it just listening on the air. Monitoring the low end of 20, just outside 14100 kc, any night three of four phones can be heard messing up dozens of c-w DX stations. We haven't heard of any cases where c-w stations have done likewise to phone stations. Suggesting that these foreign phones cooperate is not enough. We must make concrete plans to insure their operating pleasure as well as our own, but in planning c.w.-phone subdivisions let us consider the space now occupied by their seemingly indiscriminate selection of operating frequencies. Let's share and be fair to everyone!

What's Your Frequency?

We have just gone through our own personal log of stations heard operating outside the band and it numbers over 100. The FCC has a list of considerably better than that. Fortunately, the FCC is a law enforcing body that is as anxious to help and guide the amateur as it is to apprehend violators of the rules and regulations. Amateurs who slip out of the band by error, either of frequency-measuring equipment of maladjustment of equipment, can expect sympathetic attention from the FCC. But the other kind of ham, the intentional violator, woe betide him! Already instances have been recorded of amateurs moving outside the band to snag some elusive DX sta-

[*Continued on page 66*]

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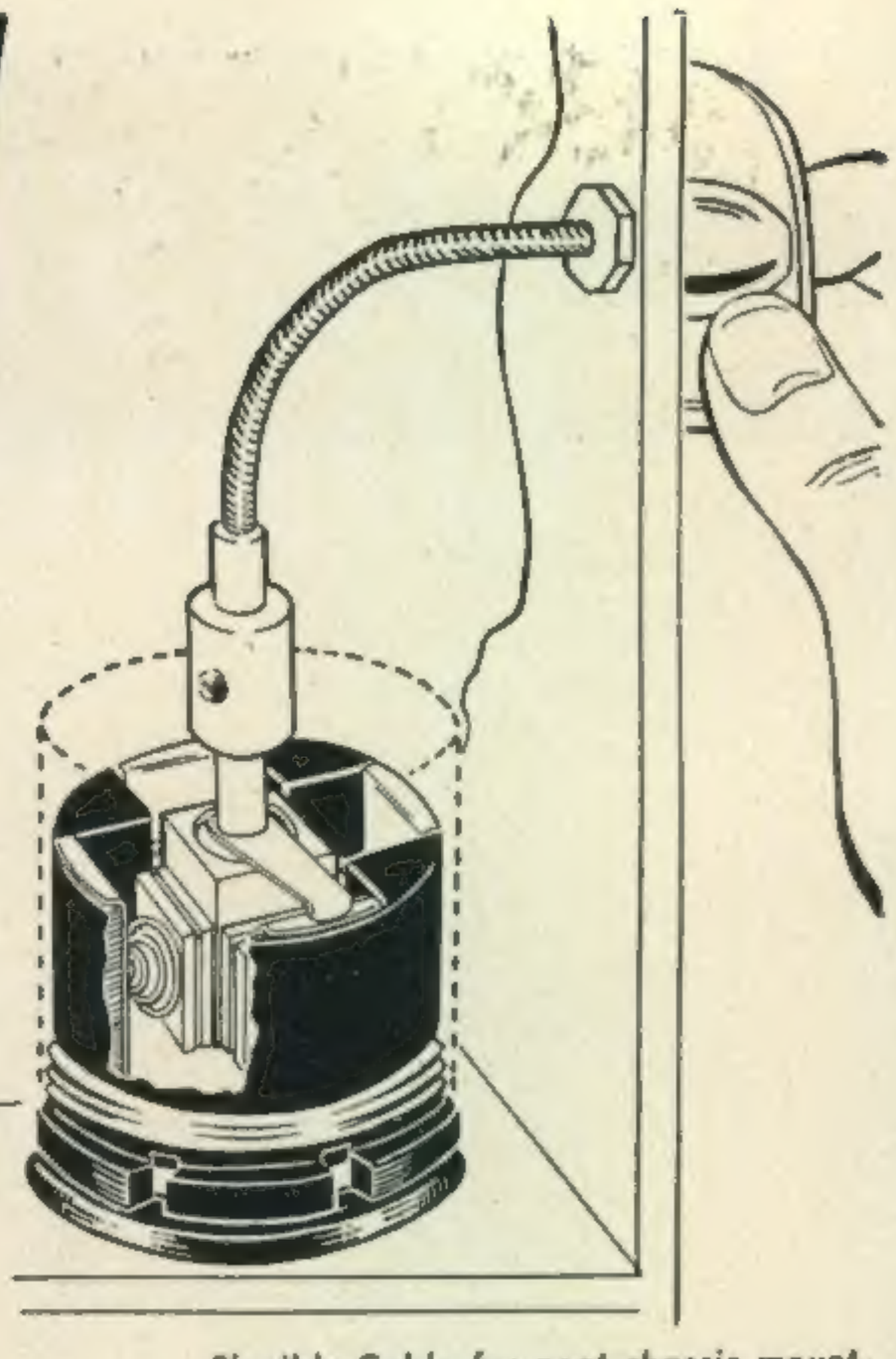
for Quick Change of Frequency in any Transmitter . . . Facilitates Operation in any one of Four Channels.



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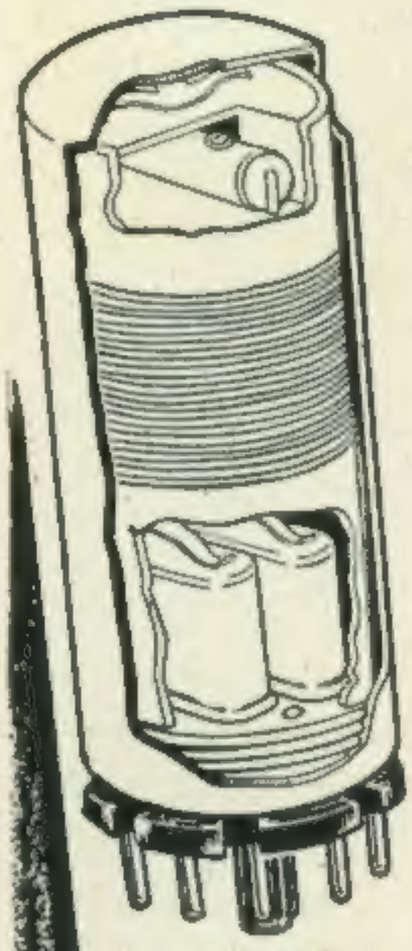

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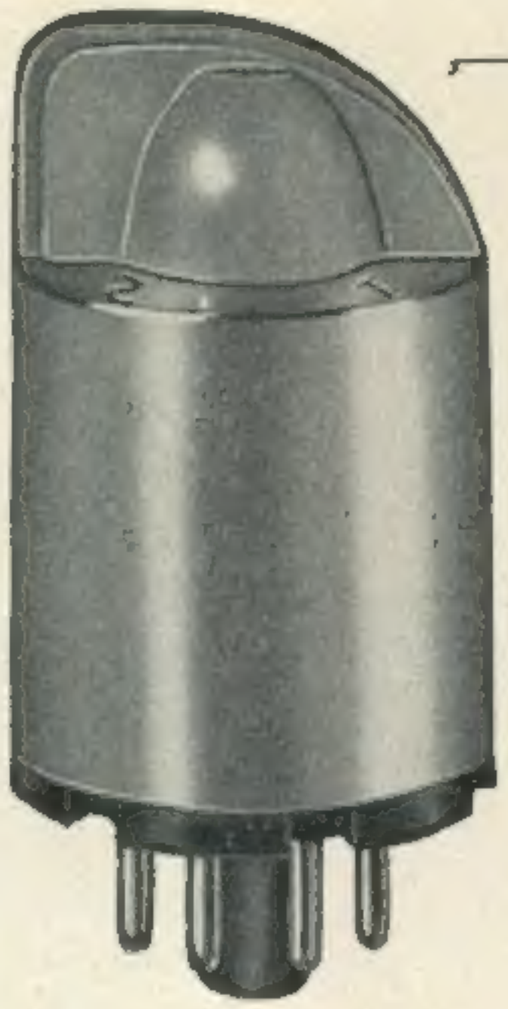

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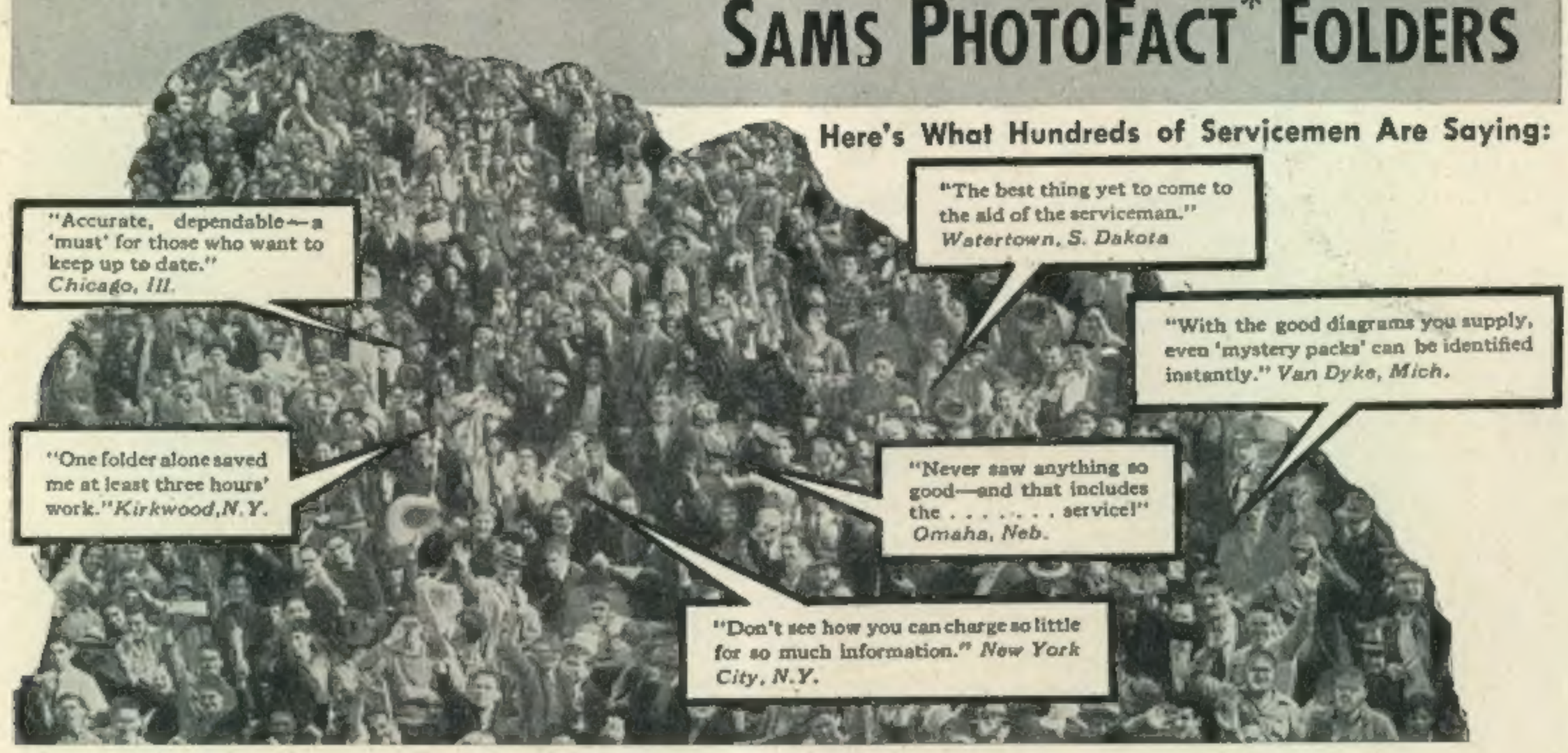

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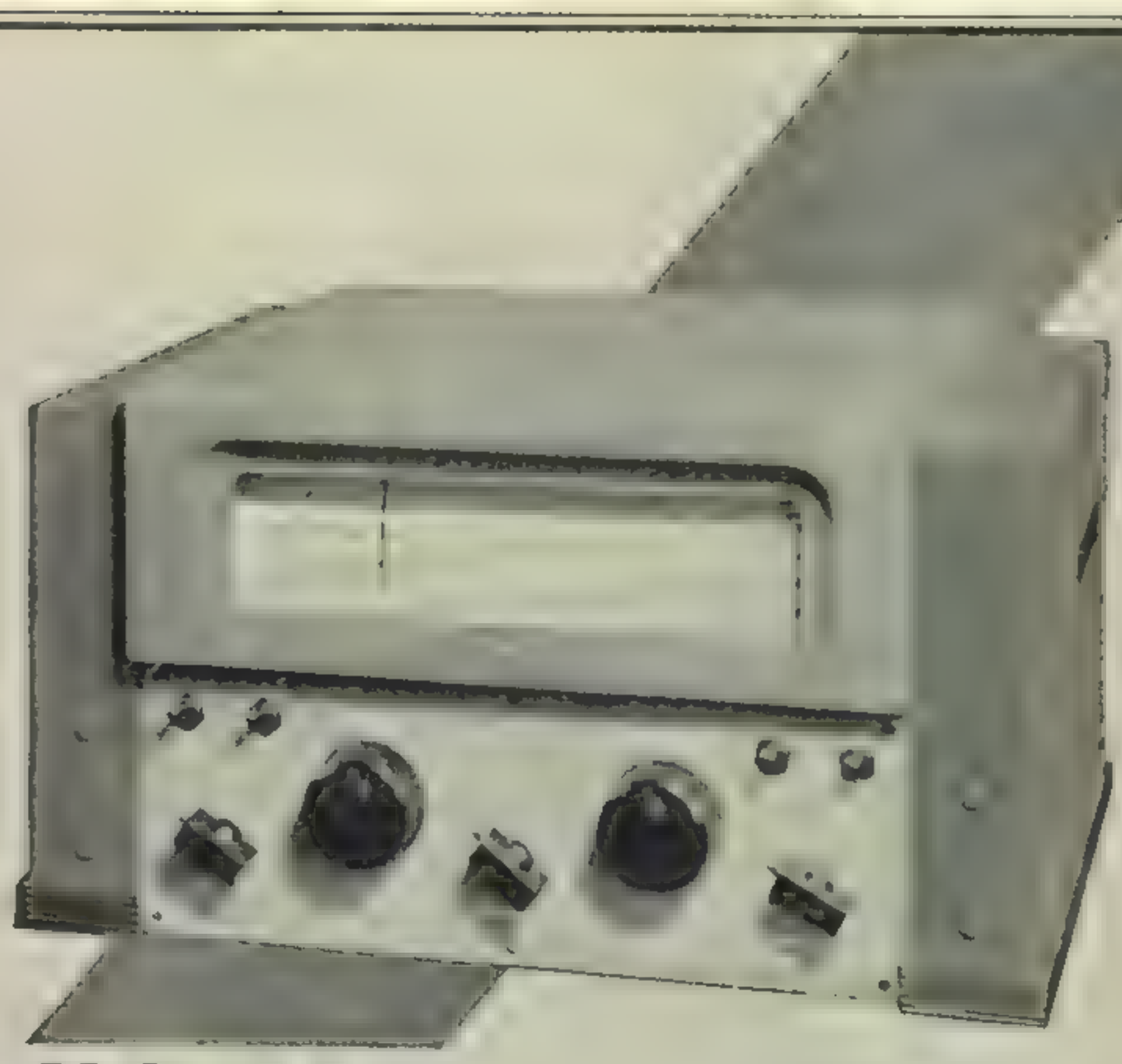

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Fig. 3. W3HWN checks over the coaxial cable connection to the Q section of his 16 element 144 mc array. The measured gain of the beam was 16 db with a power ratio of 31 to 1.

16 Element Array for the 144 MC Band

PAUL HERTZLER, W3HWN*

Holder of the existing 2-meter DX record, the secret of W3HWN's remarkable success on 144 mc is this 16 element beam.

ON ANY AMATEUR band a lot can be said in favor of taking the time and trouble to build a good beam antenna. On 50 and 144 mc, the multi-element array is a particularly logical consideration. During the war many of us have seen the theory and construction of directive v-h-f antennas in actual practice. Before the war we know that those on 5 and 2½ meters who consistently worked and were heard beyond 100 miles were using good beam antennas. If they did it then, in view of greatly improved receiver and transmitter techniques, there is no sensible reason why many more cannot do it today. From contacts at W3HWN it is apparent that many possible DX contacts around 200 miles are being missed simply because the fellows in the congested city areas neither hear the DX or are able to override the local QRM.

*209 W. Maplewood Ave., Mechanicsburg, Pa.

Designing The 144 Mc Array

Before constructing any v-h-f multi-element array, certain design considerations should be kept in mind. A compromise between Q of the antenna and the possibility of shifting frequency within the band will dictate a fairly broad band array. Of course, this does not mean that operation at random frequencies will load the antenna properly, no matter if you are on the edges or in the middle of the band. Off-frequency operation (i.e., 400-500 kc off resonant antenna frequency) leads to useless and unnecessary grief and the liability of a poor standing wave ratio and resultant BCL trouble. The array spacing should be at least one-quarter wave to keep the impedance as high as possible. The beam should also be compact and light enough in weight to permit erecting to the maximum available height with facilities for mechanical rotation. With these basic

Fig. 1. Looking down the broad face of the eight half waves in phase with reflectors. Note that the phasing wires are not crossed at the Q bars and both lower half waves are fed from the same Q section.

thoughts in mind, the 16 element double Lazy H shown in *Figs. 1, 2* and *3* was constructed by the writer. The array appears to fulfill all the requirements outlined above and has worked sufficiently well in practice to warrant a discussion of the fine points in its construction.

Construction Of The Array

Table 1 gives the dimensions of the radiators, reflectors and matching sections for this array. The frame holding the elements is made of ⅞ x 1½ inch lumber. The four cross pieces joining the main support are made of 2 x 2 stock. These are held by one ¼ inch bolt per pair which runs through to the 2 x 2 main support. The Q section (*Fig. 2*) is mounted on two strips extended from the main pole and just long enough to place the Q section straddling the phasing section. Two-inch wood screws are used throughout for assembling the frame. Generally, nails will not suffice to hold an antenna of these dimensions together if the assembly is to be rotated. Sad experiences have resulted from the starting and stopping of antenna frames that were only nailed together. Because aluminum tubing was not available at the time of construction, we were forced to use hard-drawn ¾-inch copper tubing.

The elements themselves are mounted on 1½-inch stand-off insulators by a strap of copper 1-inch wide that is bent completely around the element and soldered in place. After assembling the wood frame, the eight reflector elements are mounted. This is done so that the Q section does not support the full weight of the array. Spacing between the inner edges of the reflector elements is two inches. This applies to any frequency in the 2-meter band. Next the entire frame is turned over and the driven elements are mounted. The spacing between the inner tubing ends is also two inches. The Q section is constructed on two pieces of mycalex or similar material and a stand-off insulator mounted in the center of each. The Q bars are then placed on the two strips which extend from the main support and are centered by adding washers under the mycalex strip.

As shown in *Fig. 1*, the phasing sections are made of number 10 enameled wire and are crossed over in interconnecting the driven elements The middle section is not crossed, but is fed by the Q section in the exact center. The wire was cleaned and wrapped around the end of each element and then securely and electrically soldered in place. It is best to connect the phasing wires to the Q section as the last thing. These can then be stretched taut and soldered to the Q bars. Between the outer pair of driven elements two 2-inch spreaders were used to keep the spacing constant. Connect the feed line to the bottom ends of the vertical Q bars and the array is ready to raise.

Matching The 144 Mc Array

The exacting amateur will find it to his advantage to check the matching once the array is up in the clear. The best way to determine the characteristic impedance of the Q section that will be needed is to connect a convenient length of known value transmission line to the middle phasing section and excite the array with the transmitter. This provides a method of measuring at first hand the standing wave ratio.

A thermo-galvanometer should be used to measure the standing wave ratio. It is not advisable to depend upon the well-known flashlight bulb method, as this has proven to be entirely too inaccurate. Do not begin measurements too close to the transmitter as the immediate field of the tank circuits may be sufficient to cause a deceivingly high reading. If the feed line is to be the commercially available "twin-lead" it will be necessary to mount the transmission line on a rigid backing to permit readings which are always the same distance from the line.

Once the standing wave ratio has been ob-

TABLE 1

FREQUENCY-MC.	RADIATORS	REFLECTORS	PHASING SECTION	Q SECTION
144	38.5"	40"	39"	19"
145	38.2"	39.7"	38.7"	18.8"
146	37.9"	39.4"	38.4"	18.7"
147	37.6"	39.1"	38.1"	18.5"
148	37.4"	38.9"	37.9"	18.4"

All reflectors spaced 20" from radiator

tained, we may find the impedance at the center of the phasing section by simply dividing the standing wave ratio into the characteristic impedance of the transmission line. Or, where the resonant frequency of the antenna array is equal to the radiated frequency and where a 450-ohm line was being used at a 3-to-1 ratio, the impedance to be matched must be 150 ohms.

The next step is to determine the proper value for the Q section. This is done by taking the geometric mean between the impedance just determined and the impedance of the feed line to be used. When the pictures of the array were taken, the "twin-lead" cable had not been placed on the market and for this reason a Q bar section equal to 104 ohms (the geometric mean between 150 and 72 ohms) is shown. However, certain informants told us that the particular cable in use had a 13 db loss per hundred feet, which more than lost the best part of the gain from the array. Consequently, an improvement resulted with the substitution of 300 ohm twin-lead for the coaxial cable. The Q section now in use is 212 ohms, which is attained without the necessity of paralleling the Q bars. Some trouble has resulted from the rain effects on the twin-lead which was overcome by slipping garden hose over the transmission line. With correct matching through the Q section the array should perform equally well on either type of feed line.

Field Measurements

In *Fig. 4* we have shown the field strength measurements taken on several different types of antennas and beams. All the arrays were of the same height and measured with the same equipment. Curve "A" represents the field of a square corner reflector with a folded dipole as the driven element. A very good forward gain is obtainable with this array, but appears to be rather broad. Curve "B" represents the effective field of four half waves in phase with reflectors. This beam appeared to be quite a bit sharper and has a little more forward gain. The extended curve "C"

[Continued on page 67]

Fig. 2. Closeup of the Q section showing the method of mounting for vertical polarization. Parallel Q bars of approximately 210 ohms are used to obtain the 104 ohm impedance to match a coaxial cable.

SUPER-REFRACTION

THOMAS W. SWAFFORD Jr., W5HGU*

The most sensational discovery in wave propagation made during the war years is super-refraction. This is the first of several articles that will present the new theory of v-h-f and u-h-f propagation beyond the optical horizon. Previously, extended v-h-f ground wave DX was thought to be a single refraction at an air mass boundary. Radar has proved it otherwise—it is the principle of the guided wave—or super-refraction

Whether super-refraction is an old propagation effect in a new guise or not, is far more than an academic question. Many old-timers will recall a statement attributed to Signor Marconi as a result of his Mediterranean experiments in the early thirties. In the face of every engineering opinion to the contrary, Marconi maintained that centimeter waves could be made to circle the earth. Unfortunately this prophecy, if it was one, appears to have been made 15 years too early in the unbelievably short history of radio. Recently the U. S. Navy Department announced plans which appear to add credulity to Marconi's statements. Sir E. V. Appleton in speaking before the Royal Meteorological Society about the effects of unusual temperature and humidity gradients upon radio transmission stated certain examples of extended ground wave DX which must make every v-h-f man envious. While radar experiments do indicate that centimeter waves can exceed their optical horizon limits by as much as 500%, the best ranges were obtained on a 175 mc radar unit in Bombay, India. With the antenna 160 feet above sea level it was possible during the hot season to see ships at sea which were 400 to 700 miles distant. The most consistent DX, however, was the coastline of Arabia, 1000 to 1500 miles away! The opportunity the amateur has of getting in on v-h-f and u-h-f DX through super-refraction and atmospheric ducts should not be underestimated. Also, DX need not be a hit-or-miss matter. Certain weather conditions which are commonly observed provide an index to gage the possibilities of working out over the quasi-optical range. The first introduction to this subject is naturally, basic—and to this Mr. Swafford does an excellent job. This article should be a "must read" on the list of every serious minded progressive amateur.

WHEN THE V-H-F man speaks of extended ground wave DX, he generally says that it has something to do with certain weather conditions and if equipment were on an even par, 2 meters quite likely would be a better DX band than 6 meters. This summation expresses the state of amateur and radio engineering knowledge in this subject before the war. Since that time, however, the inevitable boom in v-h-f and u-h-f techniques has caused a world-wide investigation into the obscure hypothesis of lower atmosphere refraction. The result has been the discovery of the atmospheric duct, a distant relative of the wave guide.

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Bending of V-H-F Radiation

Let us see what happens to a ray emanating horizontally from a radio transmitter as we vary the height of the transmitter above the surface of the earth. This is illustrated in *Fig. 1*, where we start with the transmitter many thousands of feet up in the air at T_1 where the atmosphere is thin. A ray emanating horizontally from a transmitter at this great height would be practically straight and would show no appreciable tendency to follow the curvature of the earth.

Now let us bring the transmitter gradually down toward the surface of the earth. As we do this a ray emanating horizontally is subject to more and more downward curvature tending to make it follow the earth's curvature. When the transmitter has been brought nearly down to the earth's surface, it reaches a certain level (T_2) in the atmosphere where the downward curvature of the ray becomes equal to the curvature of the earth. With the transmitter at this critical level, a ray radiated horizontally remains at the same height above the earth's surface and does not fly off at a tangent. This vital level where the downward curvature of a ray is equal to the curvature of the earth forms the top of what is known as the radio duct. In simple cases the radio duct extends from this level right down to the surface of the earth. As we bring the transmitter down below the top of the duct a ray emanating horizontally (*say* T_3) is bent downwards to such an ex-

tent that it hits the earth and suffers successive reflections. The ray, is in fact trapped within the duct. It is trapping of this sort that causes v-h-f and u-h-f signals to be received beyond the geometrical horizon.

The distance from the surface to the top of the duct is, in simple cases, known as the radio duct width. The magnitude of this duct width is a vital quantity in determining the degree of super-refraction present. Over large areas of the world for a large part of the time the duct width is less than 10 feet. The degree of super-refraction experienced by v-h-f signals is then so small that we usually neglect it. But in suitable weather conditions the duct width may increase to 100 feet. A moderate amount of super-refraction is then experienced especially on the centimeter wavelengths. In some parts of the world duct widths as great as 1000 feet occur and intense super-refraction is then experienced.

The cause of this downward bending of the radio wave is similar to total internal reflection of a transparent pane of glass. But, actually the bending is a succession of gradual refractions as the density of the atmosphere decreases with height. We may think of the atmosphere as a series of slabs of air, each one being less dense than that below (*Fig.2*).A ray going obliquely upwards in the bottom slab is bent away from the vertical on entering the second slab. This process goes on until the ray strikes a slab at a sufficiently glancing or oblique angle to be reflected back, instead of passing through. On its downward journey it is entering denser slabs, and is consequently bent towards the downward vertical. The actual atmosphere is not divided into discrete slabs, and the bending is continuous. (*Fig. 3*, where the dots indicate density variations). The downward bending of rays in the atmosphere is therefore caused by a decrease of density as we go upwards. This decrease of density is apt to be quite pronounced close to the surface of the earth, and this is what produces the atmospheric duct.

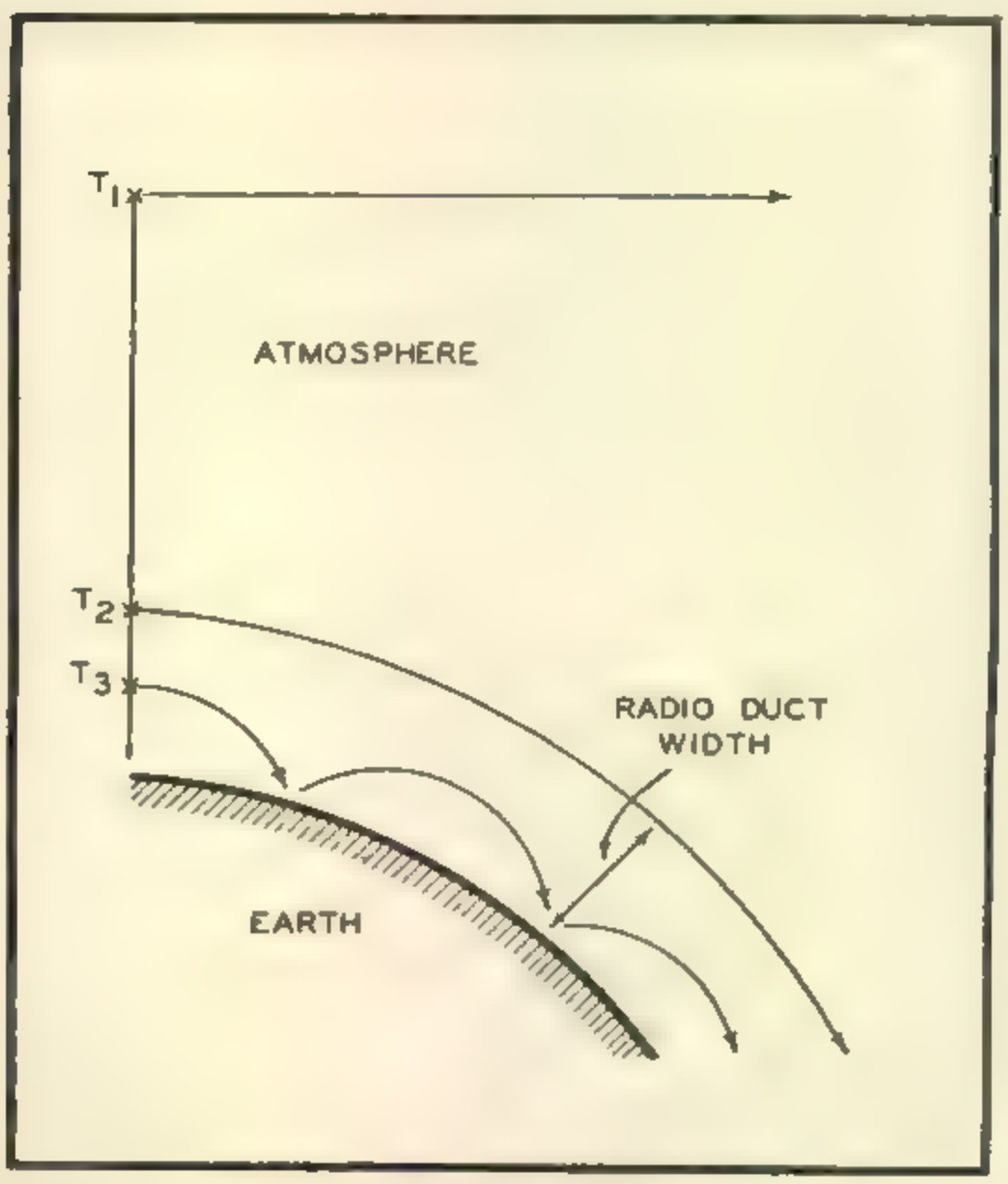


Fig. 1. Refraction of v-h-f radio signals depends upon the height of the transmitting antenna and the density of air through which the signal is propagated.

The Wave Guide Action

An important question occurs to one in the light of what has been said about refraction around the curved surface of the earth. We might expect that we could always transmit beyond the geometrical horizon merely by putting the transmitting antenna down into the duct. This is, of course, not always possible. First, the atmospheric duct has certain properties in common with metallic wave guides often used in centimeter work. Such wave guides will only transmit efficiently waves less than the cut-off wavelength. The larger the wave guide, the longer the wave we may transmit through the guide. This is the same with an atmospheric duct.

Consider for example a wavelength of 10 centimeters. For this wavelength a duct width of 10 feet would have no effect upon extension of ground wave. If the duct width is increased to 100 feet, the guiding action becomes more efficient. It is only when the duct width is increased to several hundred feet or more that 10 centimeters produces unusual coverage. Now consider a wavelength of 1½ meters. For this wavelength even a 100 foot duct width is comparatively inefficient and does not differ appreciably from the corresponding coverage in the absence of the duct. On this wavelength, guiding around the curvature of the earth does not really become efficient until the duct width has increased to seven or eight hundred feet. In its most intense form, as the introduction has pointed out, 1½-meter signals can be heard or seen over 1000 miles distant. It is only when the duct width has a rather large value of say 1500 feet or more, that rays give a reliable picture of what is happening within the duct beyond the geometrical horizon at a wavelength of 1½ meters. The conclusion is that signals within the duct, in comparison with signals above the top of the duct, only have a marked advantage of traversing beyond the geometrical horizon if the duct width exceeds an optimum value of 700 feet at 150 centimeters. The effect of the duct may now be summarized.

Since only a little power is trapped within the duct, we find that low angle radiation is particularly important. Since this energy is prevented

from spreading out vertically, the field strength within the duct exceeds the normal free-space attenuation. The duct is created by the decrease in density of the lower troposphere and the variations in duct width are the determining factors in what effect the duct will have upon certain frequencies.

The Meteorological Action

The atmospheric duct is formed under certain types of weather conditions, or climate. In certain portions of the world, atmospheric ducts are very frequent, in others they seldom occur. The density of the atmosphere is directly related to the refractive index of the air, which is in turn a quantity related to the temperature and relative humidity.

The equilibrium of the atmosphere is based upon a normal decrease of temperature of the atmosphere equal to approximately 5 degrees per thousand feet in altitude. The reduction of this lapse-rate is particularly important in bending of radio waves. Suppose for example that an aircraft observes the temperature at 2000 feet to be 60° F. Then, allowing 5° F for each thousand feet of descent, the expected surface temperature should be 70° F. Upon landing, however, the surface temperature was found to be only 68° F. The temperature excess is said to be 2 degrees. Also important in considering the atmospheric duct is the presence of water-vapor in the atmosphere. Water vapor in the atmosphere is the type of humidity that surrounds us daily and may be seen in its invisible gaseous state near the spout of a boiling kettle. The water vapor in the atmosphere does not refer to the clouds or fog, as these are liquid droplets and have little effect other than an absorption of microwaves.

Water vapor may be measured in terms of relative humidity, but for our considerations this term is unsuitable. A much more appropriate measure of humidity is given by taking a kilogram of air and weighing the amount of water-vapor in it. Suppose that we found that a kilogram of air contains 10 grams of water. We then may say that the specific humidity of the air is 10 grams per kilogram.

We are now in a position to see under what considerations temperature and humidity aid in the formation of the atmospheric duct. This occurs when there is a sharp decrease in the content of water vapor as we ascend in the atmosphere near the earth's surface. The differences between the specific humidity of the upper atmosphere at heights of a few thousand feet and that at the earth's surface is called the humidity deficit. The upper troposphere is unusually dry in comparison with the surface of the earth, if the humidity deficit is say, 5 grams per kilogram or more. To produce a favorable refractive index for the formation of a duct, the upper atmosphere, must in comparison to the surface, be warm (temperature excess) and dry (humidity deficit).[1]

[1]The refractive index variations as related to the temperature and specific humidity of the air will be covered in subsequent papers. It is only necessary now to accept the version as portrayed by Mr. Swafford. *Ed.*

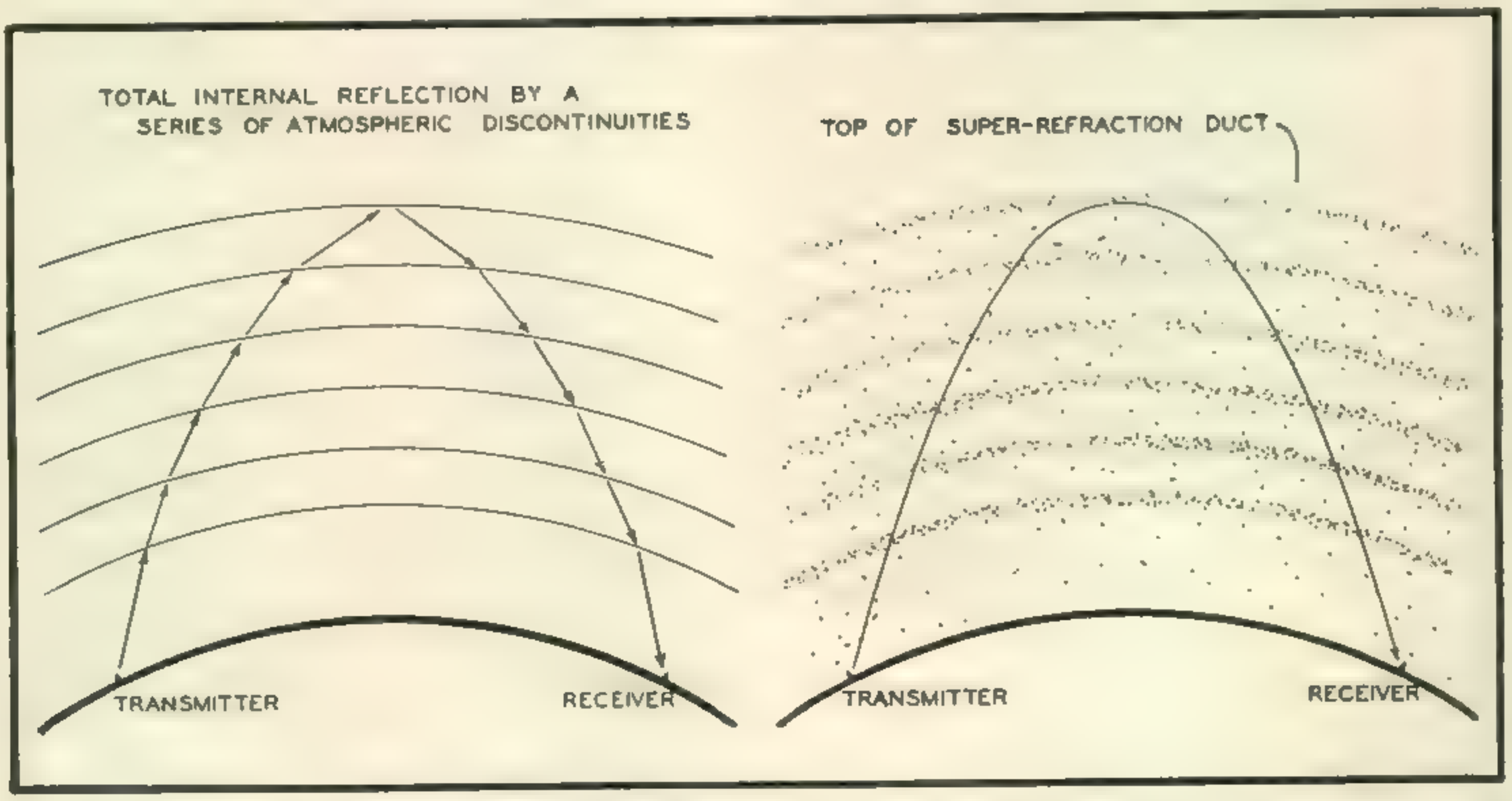
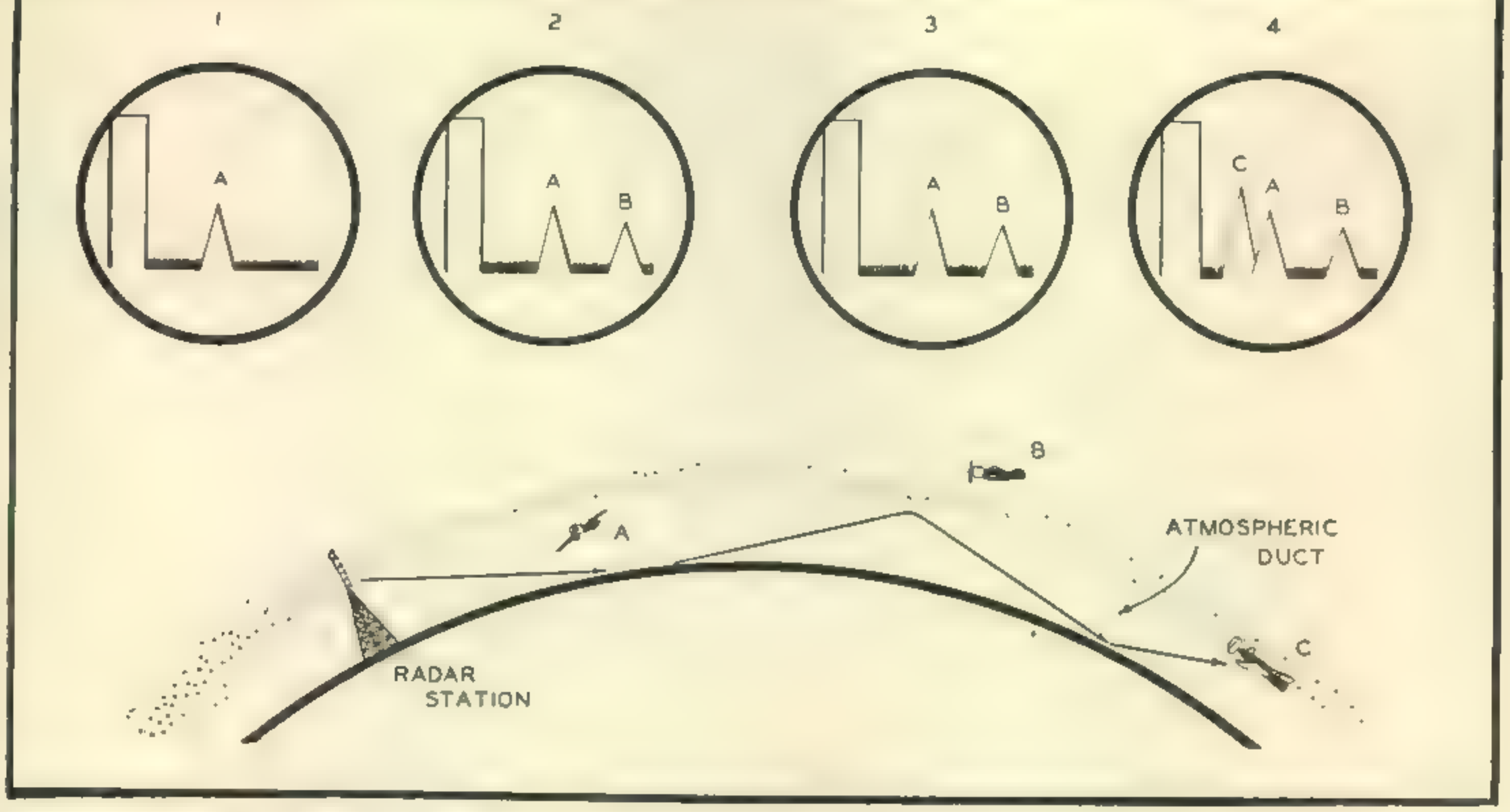


Fig. 2 (left). Greatly exaggerated. Illustrating the refraction of successive "slabs" of air at decreasing densities.
Fig. 3 (right). Greatly exaggerated. Illustrating the gradual refraction as it occurs in the troposphere.



Trapping of the v-h-f and u-h-f radio wave within an atmospheric duct often permits radar vision far beyond the horizon. In the situation pictured above, the radar pulse will first intercept the airplane *A* which is portrayed on the oscilloscope screen #1. In the next instant the radar pulse echo will return from plane *B* (screen #2) which is above the upper edge of the atmospheric duct and loses a considerable portion of its signal strength by inferior bending. Over the entire scanning area seen by the radar, only those airplanes in screen #3 would normally be seen. The radar repetition pulse now begins its second sweep. However, because the pulse is trapped within the duct a strong echo returns from airplane C which is far below the normal horizon. Early radar operators found that a strong pulse echo appears much closer to the radar than airplane *A*, while because of intense super-refraction it is beyond the horizon and far beyond the plane *B*.

What Types of Weather?

The broad answer to the weather question is unusually simple. Orthodox ground wave communication may be expected and can be associated with poor weather, whereas practically all forms of super-refractions are associated with fine weather. Weather that is cold, rough, stormy, rainy or very cloudy usually produces a situation wherein the lower atmosphere is quite well stirred up. Consequently there is no sharp decrease in density as we ascend and therefore, no atmospheric duct. On the other hand, in weather that is fine, clear, settled and generally anti-cyclonic, air in the upper atmosphere is gradually descending and bringing potentially warm, dry air down to within a few thousand feet of the earth's surface. Obviously, this is likely to create a situation in which the upper air at a height of a few thousand feet is warm and dry in comparison with the air at the surface.

If we consider this in finer detail we may examine what happens inland. In the morning the sky is clear and the sun is shining. This heats up the land until, shortly after midday, the temperature of the land reaches the true temperature of the atmosphere. Consequently, while the upper air is dry and warm during the afternoon, in comparison the land is slowly cooling down, until as the sun sets the land is attempting to reradiate a portion of its warmth back into the atmosphere. The result is that the air near the surface is cooling off while the upper air is still comparatively warm. We may consider that the upper air does not lose its warmth as rapidly as the surface and if the temperature drops 10 degrees after dark, we may use this as a measure of the temperature excess. In some parts of the world, the surface temperature will fall rapidly some 25 to 30 degrees and on clear, fine days and nights, super-refraction will be particularly intense.

Over water, this anti-cyclonic condition is extremely simple. The surface undergoes no marked temperature variation during the day and air in direct contact with the sea will be cool and moist. Consequently over certain water paths, super-refraction will not only be intense, but continuous during fine weather. Super-refraction over the sea tends to be most marked on the lee-

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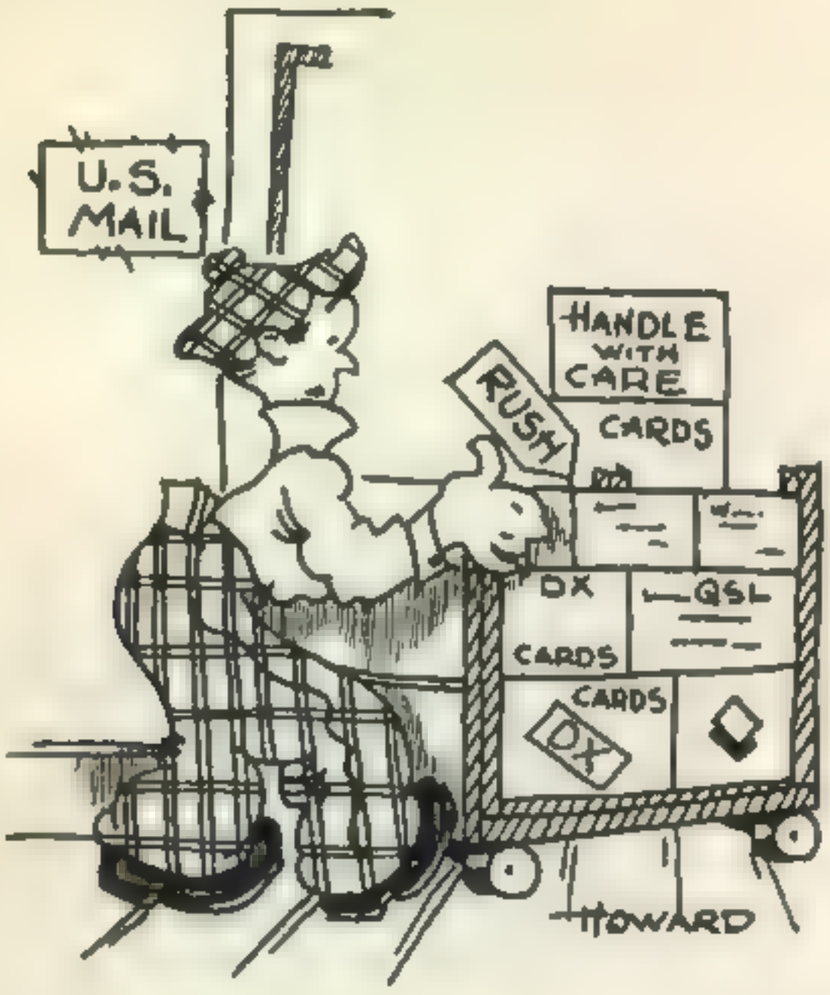


So—You're Going to Start a DX Factory?

ROBERT W. LIESON, KF6SJJ/1*

WITH AMERICAN AMATEURS finding themselves in stragetic spots with an opportunity to set up their own DX station, many such stations are starting up in foreign lands and remote and isolated locations. Let's consider the problems of establishing such a station and discuss a few of the questions that will arise in connection with operation on that "desert island" that will soon be your Ham Paradise. Well—you can dream, can't you?

Suppose you have your spot all picked out or have been assigned to a likely location. Let's look at the equipment angle. What gear is already available? Is it adequate for your ham tastes? Is it accessible for your *own* use, or will you have to stand there and drool at the sight of untouchable equipment and antennas. As to adequacy—when I went out to Howland Island some years ago† I did not make a careful investigation of the equipment situation on Howland, and by this neglect I lost four precious months of DXing before getting a decent rig going. I should have inquired into every detail—as to source of power, the transmitter, the receiver, the antenna system, the spare parts situation and the actual *usability* of the available gear. What I actually found was a receiver without bandspread, an antiquated transmitter, a worn-out dynamotor, a beat-up windcharger and an old gasoline "putt-putt," that was supposed to charge the batteries but only caused QRM to the broadcast set in camp. I did not know that the transmitter would work only on 40 meters and that it was also an awful pile of junk. I found all this out—too late—and lost a lot of time in trying to patch it up.

After four months delay I obtained (by slow boat) a new transmitter, a suitable power supply and an a-c gas-engine-driven generator. That new gear enabled me to spend all the time I wanted to on the air, due largely to the presence of an over-sized supply of gas left by previous ops.

OK so far? Now how do *you* go about it? The best source of information is the guy you are replacing or some ham who has been out there where you're going. Do not take hearsay or relayed information to be more than 10% truth. It usually is wrong in all the important phases. Get hold of some lad who has been *on the spot* and have a questionnaire ready, so that he need only to fill in the empty spaces. In that way you will be more likely to get a full and detailed reply.

Notice the tropical splendor in the background . . .

*17 Litchfield St., Springfield, Mass.

†"Hamming on Howland Island," Robert W Lieson, *QST*, April, 1941

Ask all the questions you can think of on all points. Even if you can *talk* to this "expert," the questionnaire idea is not to be overlooked. The things available and suitable for your use will save you the trouble and expense of finding, transporting and paying for them. On the other hand, it's far better to be sure you will have the items you need and require than to have some vague idea, like "you might find one of those kicking around somewhere." The things that are not available at your location when you need them will be the things you will miss most! The item I wanted most on Howland? Just "one lil' ole neon bulb!" Why didn't I take a gross of 'em!

These suggestions will apply to a lot of situations, so let's look at a typical problem. Suppose we consider that there is nothing available at your proposed Ham Heaven, at least you cannot find out what is there, so you conclude that there isn't anything! And now for what has to be taken along to set you up in the DX business.

The Essential Tools

Item One. The transmitter! My experience at KF6SJJ and facts gleaned from other DX ops, indicate that about sixty watts output is enough. Let's say around a hundred watts input. That permits a fairly low initial and operating cost. In normal times, when we have the use of all our frequencies, a rig that will put out sixty watts on 20 and 40 meters is plenty adequate. If it looks like 10 will be "hot" during your stay, include output on that band too. The transmitter should be crystal-controlled for simplicity and to make it easier for the Stateside DX hounds to sniff you out. *You* won't need many frequencies. A couple spots in each band, with locations *in from the band edges*, will do wonders. But be *sure* and have duplicate crystals for each frequency, since those spots will be your stock in trade and you don't want to have to move just when you have your DX factory running and business is booming with all the home boys frothing at the mouth.

The transmitter should be compactly and ruggedly constructed, using reliable, standard components, all having a safety factor of at least 100%. Resistors and condensers should be rated well over twice their operating usage. All tubes and transformers should be underloaded.

The rig should be built with the basic idea of easy tuning and adjustment, as well as for accessibility of all components and with a high degree of performance over long periods of time. Quick bandshift and QSY facilities can be left for the mainland stations, who will need them. You won't! You have the time and *they* will be looking for you. You'll hear them and they'll hear you, if you stay on one good spot long enough.

If you are 'phone-minded, see to it that your 'phone is working properly. A DX station, working 'phone with c-w mainland ops, can knock them off like sitting ducks.

After the transmitter is completed and thoroughly tested, prepare an accurate and legible circuit diagram, (in waterproof ink) and glue or cement it right into the transmitter case. Make sure the values of all components are clearly marked.

If you are going where the temperature and humidity values run high, be sure your components are built to take that sort of treatment. A burned-out high-voltage transformer might put you off the air. The manufacturers can furnish advice concerning products built to stand the tropical hazards. They learned the hard way in the war. Tropicalization adds little to the original cost but is a boon to the remotely-located amateur operator.

Next, consider the receiver. Personally, I prefer a job operating from B-batteries if possible. It should have adequate bandspread and reasonably good selectivity. You'll have trouble enough peeling off the layers of R9+ stations, to get at the weaker ones, without the handicap of an unselective receiver. A "super", working from batteries (even if the loudspeaker has to be eliminated) will work wonders out where the background noise is nil and signals are loud. A good t-r-f job will also be adequate, if there is no local QRM. And, it might be well to make sure your receiver has general coverage as well as bandspread. You might want to listen to some shortwave jive. What you need is just a simple receiver, that can be handled easily and accurately, with good stability and low power drain. You won't need any fancy trimmings, but you will want to keep the receiver working!

Skywires

Antennas? There is a problem of major importance. Since you have only a vague idea of the terrain and other characteristics of your new QTH, you will not know what is required. But just one well-known truth about antennas may help you out—those sky-pieces with the most wire, properly used, usually do the best job, whether the wire is staked up or stretched out. Vees, rhombics, curtains and such will raise that sixty watts of yours to an effective value if they are oriented and adjusted properly. So—the answer to the antenna problem is *wire* and a few accessories. With these supplies you can put up the best possible antenna, and one that fits the situa-

tion at hand. It is usually hard to tailor-make an antenna in advance so take plenty of "makings."

Hard-drawn #14 is plenty tough and is not expensive. Copper-coated steel is strong too, but costs more. When you prepare your wire for shipment, divide it into separate bundles so that if one roll goes over the side while unloading, you will not be out of business. That is what actually happened to Gerry Sayre, OX2QY, some years ago up North, and that loss of 2,000 feet of wire really cramped his style! When you have calculated the quantity of wire you think you'll need—*double it*. Then you will have about enough.

Insulators? Take along a batch of a well-designed type that has no excess weight and yet has the strength to take the pull of a 1,200-foot long wire. Include feeder spreaders and a few hundred feet of that flat line, the 300-ohm variety.

Don't overlook rope. Take several hundred feet as rope works better than wire for "hold-ups" and saves the wire for antennas. Porcelain "eggs" make good pulleys, so put in a couple dozen of them. Select the kind that will pass a ¼ or ⅜-inch line.

Power Supply

Next, we come to the power supply or source. Gasoline-engine-driven a-c generators (delivering 115 volts) have been used widely in the war. This development has made them more practical for use in remote locations—provided a few spare parts are available and that the unit is maintained in accordance with the instructions. Naturally, they take gas and oil and in some places these fluids are limited to official use only. If such be the case, find it out in time, and invest a few bucks in a drum or two of your own juice. It will be good DX insurance!

Take a tip from a guy who knows and service your generator *yourself*. Make the proper routine inspections frequently and keep plenty of oil in the engine. Follow the manufacturers' recommendations to the letter and save trouble. Above all—don't "let George do it." He won't! Do it yourself!

After selecting your generator—(the 350-watt type is not expensive and is economical to keep running), obtain a complete set of running spares such as the generator parts, spark plugs, condensers, etc., for your machine. Any spares you might find out in the field probably will be for some other type or size machine and you won't be able to use them.

If you plan on using B-batteries, be sure to procure a size adequate to handle the proposed current drains. Study the current tables and the load capacities carefully, and then get larger batteries than you calculate you'll need. The oversized ones cost less in the long run. And, speaking of the battery line, don't forget to take plenty for your flashlights—and some of those odd sizes for your test meter, too.

Speaking of test meters—every ham station should have one available. The small ham-style will suffice, but one of the larger portable meters, (those that proved so useful in the war) will be handy. If a meter is not damaged by carelessness, it will survive almost any type of field use. Do not forget test leads.

An ordinary B-battery tester will be a big help if batteries are used. If storage batteries are included, how about a couple of hydrometers? The first one always seems to get broken quickly—and the second one has to last a long time.

Working Supplies

Spare parts? Let there be plenty of them! Examine each major unit of equipment and consider just what parts would be required to replace all the components that might conceivably fail. Do not worry about having too many spares. You may, but they will be additional DX insur-

Government House, Howland Island, 1940. Station KVZH-KF6SJJ was located in the room directly behind the doorway.

ance. Some military equipment even had "spare parts" for the "spare parts!" Seriously though, take a spare for each item that could break, burn out, or blow up. Do not overlook such items as dial lamps, sockets, fuses, headphones, tubes (at least 200% spares) and those duplicate crystals. Any one of these might mean the difference between being on the air—and off. Unhappy thought!

Take a good, well-used key and put in that well-trained bug, if you are a bug-man. Throw in a spare key spring or two, and an extra key lead and plug. A good supply of nuts, bolts and washers and other various items of radio hardware will also come in handy. Tuck in some assorted woodscrews, brackets and a collection of nails.

As for tools? Let your own work habits guide you. But you can probably get along with side-cutters, a long nose, a pair of gas-pliers (Model T type) some assorted screw-drivers (including at least two pocket-sized ones for setscrews) and some small wrenches. The "musts" include a soldering iron of reliable make, a soldering copper (the kind that heats over a flame), a big roll of rosin-core solder, a can of non-corrosive flux, a packet of sandpaper and a roll of steelwool. A small hand drill, with a collection of usable drills and some taps and dies, dime-store variety (6-32 and 8-32 thread) will be valuable. A few hacksaw blades and a light saw frame, a few assorted files and a punch or two might be added. You can never tell about tools and it's better to have them than to work with a dull butcher knife and a can opener. A tape measure and a small, but reliable, compass will be very welcome when laying out and putting up antennas!

In the selection of spare parts and tools, you have to consider the locale of your station, the availability of parts, and the transportation problem. In my case, I had to wait four months between boats on Howland, while at Canton Island, the boys could get a replacement or new part by the frequently-tripping Clipper. I had more need for spares than they did—but I didn't have 'em!

QSL's

Let's imagine that you now have all your gear. It is stowed, well packed and on its way. What's the next step? Well, somewhere along the line you should notify the conductors of the DX columns in the various ham magazines. There will be an unavoidable delay between your advising them and the time your plans and frequencies can be put into print and distributed. By then, you should be on the air—we hope! Tell these DX columnists your frequencies, your hours (if you know them) and any other dope you have on your proposed operation. Then—give them the *one* and *only address* to which you want *all* your

Products of the DX factory.

QSL cards sent! Select this address with care and make it a simple one to say over the air. Stick to this one address, until the "expedition" is over and all but a memory. You'll lose QSL'S if you don't have one mail QTH and stick to it. I know, by sad experience.

You should even notify the authorities, having jurisdiction over the mail coming to your new QTH, to forward any blind-address cards to that one base address you have. Then, when you finally get home, you will have baskets of QSLs waiting you, instead of having them floating all over the world looking for "KXØUSA," For example, secure the cooperation of a pal and simply say—"QSL via W1XXX" or if you want to use one of the magazines, say "QSL via 'CQ, or ARRL' etc." Don't forget to advise the chosen party, either!

As to your QSL. You can do that after you get back or you can take out a batch of them to fill out and to mail in whatever mail facilities there are. This saves a lot of time and will help pass the hours when the bands are dead.

Operating The Station

As to the actual operation of the station itself, each of us has a different idea about operating but here are a few pointers based on experience gained in both being and "a seeker of" DX. I would set aside days in which I did nothing but work DX, and other days on which to rag-chew. I wasted a lot of time at KF6SJJ by chewing the fat when I should have been DXing and then I tried to DX when conditions were unfavorable. Unquestionably, I would *not* chew the fat at

length on days which fall on either Saturday, Sunday or holidays, back home. Those days are valuable to a lot of guys who cannot get on the air on weekdays. I well know the feelings of a guy who has to work all week and when Saturday or Sunday rolls along, finds that the DX stations are all just poking around and chewing the fat. In other words, make an effort to get on for DX when the gang can be on stateside. I also would have definite days or periods for skeds.

One of the ways a DX operator can make himself beloved by all, is to work the little guys too. They might not have the R99 signals—but remember, you were probably a 6L6 yourself once! To many of the gang, a card from a DX station means more than it does to California Kilowatt, Esquire.

One way to make guys happy is to work serial contacts. Lew Bellem did that at VR6AY with huge success. He would call CQ and announce that he was going to tune the band, say, from the high end of 20, to the middle. He would listen for five minutes and at the end of that time he would reply, giving the calls he heard and their reports, repeated twice. That system worked fine! He would do that, and then move on to fresh pastures. This serial operation, which of course must be backed up with a QSL, makes lots of friends and keeps from making enemies. Of course, it requires an exact and detailed log—but you should keep a good one anyway. If this serial system is used intelligently, and the gang make their calls snappy, the DX op can pull in a lot of calls in five minutes, and make just that many more guys feel good. This method is particularly applicable if the DX station is on fone and working c-w men.

As to the phone-c.w. question, I think that with either type of emission, the DX station should, by all means, work *both* types of back-home stations. This will give more guys a break! If the DX operator has only c.w., a "CQ phone" will bring results and if the DX station has phone, he should call "CQ" c.w. and see what happens! You can usually get more fish, if you change your bait occasionally! Careful announcement of your tuning plans and operating habits will work *for* you and will help to eliminate that "on the spot" operation that smothers your little pip-squeak of a signal and which really puts the DX man on the spot. If the DX op would refuse to answer stations who call him after deliberately getting right on his frequency this vicious practice would stop.

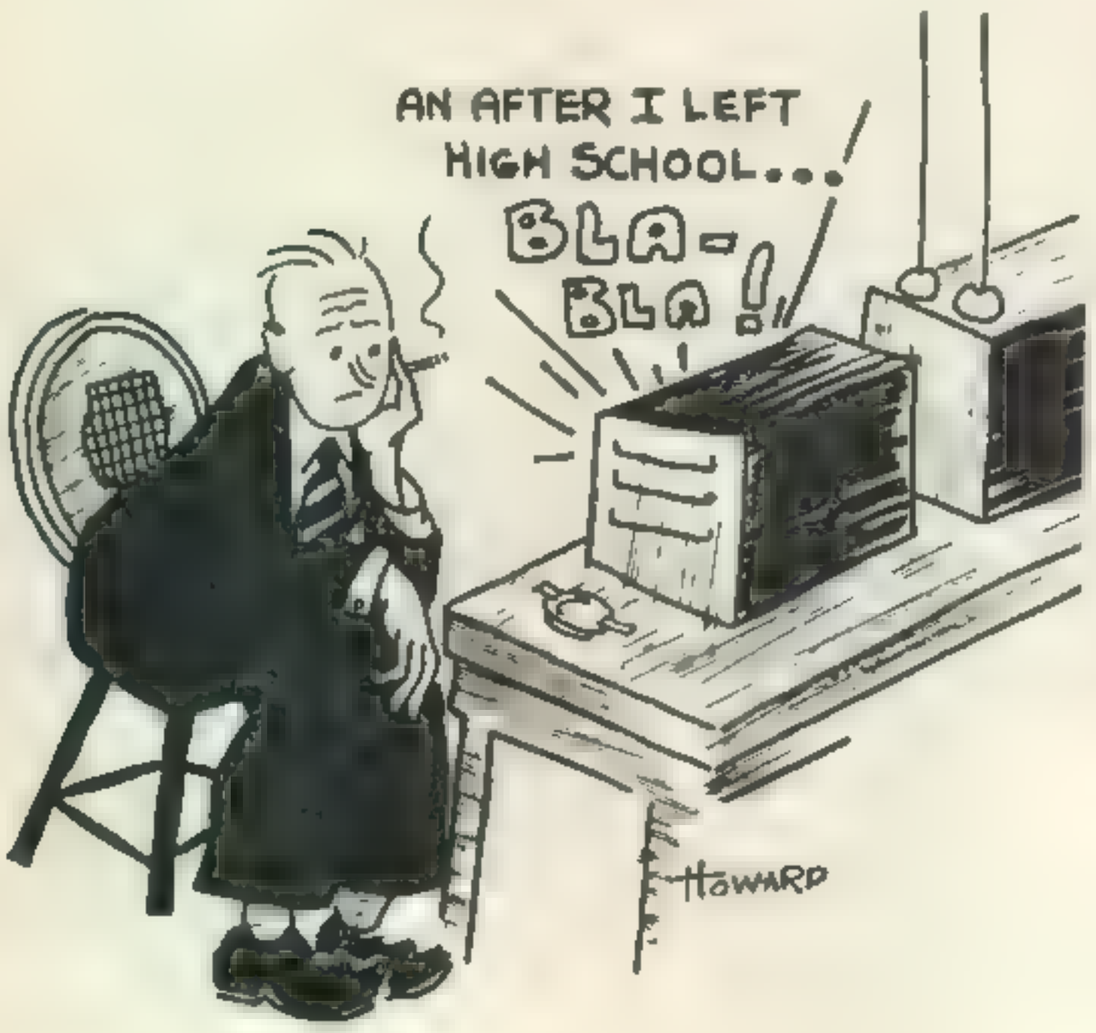
As to scheduled operation, that will depend on your locality, the time available for operation, and the reliability of your signal and that of the base station. This will take time to investigate. In the meantime you will have to hit as close to your home town as possible and let them mail the messages home to Mom.

Another thing I learned by experience, is that the DX hounds are not interested in the weather, the food problem, or the history of anybody's life. He *is* interested in his strength as compared to other stations in his locality and how he can get a QSL from *you*! So lay off the unnecessary details unless the mainland station definitely asks for them or you are just chewing the sock—and believe me, that practice of chewing the sock will pass many a lonely hour!

A few notes on non-radio items might be in order. Take a reliable camera, plenty of film, filters and an exposure meter, if available. Pack the film in glass jars, sealed tightly with rubber rings or wax. Put only a few rolls in each jar. Then after using a roll put it away in a similar jar. Stow *both* the used and the unused film in a cool dark place.

Do not forget to take some well-selected reading matter besides the radio books, antenna handbooks and other such standard equipment for a ham shack—including a copy of the latest Callbook. You won't have much inclination to read deep stuff but some *practical* radio books will be valuable. If you like to lie in a hammock or bunk and read—take a couple dozen of those 25-centers, the pocket-size books, on a selected variety of subjects. They will be informative and better than straight "who-dunits." Put in a couple decks of cards, a cribbage board, some checker men and a board, maybe some darts, and oh yes—plenty of blank log books—they will be choice reading in the years to come!

Now you are all set? I'll be looking for you. I'll be on the low end of 20—OK? Lots of DX, OM!



Portable C-W Equipment

FOR 3.5, 7 AND 14 MC

A. DAVID MIDDELTON, W1OJH*

This is the first of a series of articles by "Mid", W1OJH, of Farmington, Conn. who is on a cross-country automobile tour with this and other amateur gear.

Mid, formerly Assistant Editor and Department Editor of *QST*, will perhaps be better recognized by one of his older calls, such as W2OEN of 112 mc activities—or W9AOB, W7GLH or even W4CA, all well known in contest circles.

A practicing radio amateur since '19 and licensed since '21 (9BJL) Mid brings to the pages of CQ a wealth of "ham savvy" as well as the benefit of his radio engineering experience in both the commercial fields and as a civilian engineer with the Signal Corps Laboratories.

Although the equipment described in this article is designed primarily for portable operation from a storage battery, it would be useful as a fixed station by the substitution of an a-c operated power pack for the transmitter and the receiver filaments.

This simple but effective equipment is admirably suited for either an emergency rig or for the fixed station gear of a beginning radio amateur. It is especially applicable to those hams living in areas not crowded with other stations, since the highly-effective (but not too tolerant of local QRM) regenerative receiver will give a better account of itself when it is not "pushed around" by locals.

Most of us have heard, at one time or another, the call of the wide open spaces, and many have felt the pull of the tall timber, or have heard the urging voice of the wind as it sweeps over some high peak. To some, those wilderness whispers mean fishing tackle, guns, hiking shoes, cameras, or a canoe. But to the dyed-in-the-wool radio amateur no camp in the woods or by a mountain lake is really complete without receiver and transmitter equipment so when that familiar urge to "pound brass" creeps over our radio-happy ham, he can find, tucked away in his mountain of duffle, a simple but complete station—all ready to go on his favorite band.

A few amateurs might be able to reach into their storage closet and drag forth a trusty "emergency" rig ready to pack into their car. Others do as so many do on Field Day—throw a collection of fixed-station gear into a box and tote it cross-country and then, with a schedule approaching, try to fit these pieces into a working unit.

The writer, however, had no emergency rig, and had long since sworn off the ever-so-common practice of hauling fixed station equipment into the field, but—portable equipment was desired in connection with a cross-country automobile trip being projected for the summer of 1946. A new piece of gear was required and the following specifications were drawn up—and debated at length:

Power output—seven to ten watts would be enough.

Power supply and source—a vibrator pack operating from a 6-volt car battery. Low drain on standby essential.

Receiver—14-7-3.5 mc coverage, simple and fool-proof.

A coil must be provided for the broadcast band. Headphone operation would be adequate, but two sets were indicated.

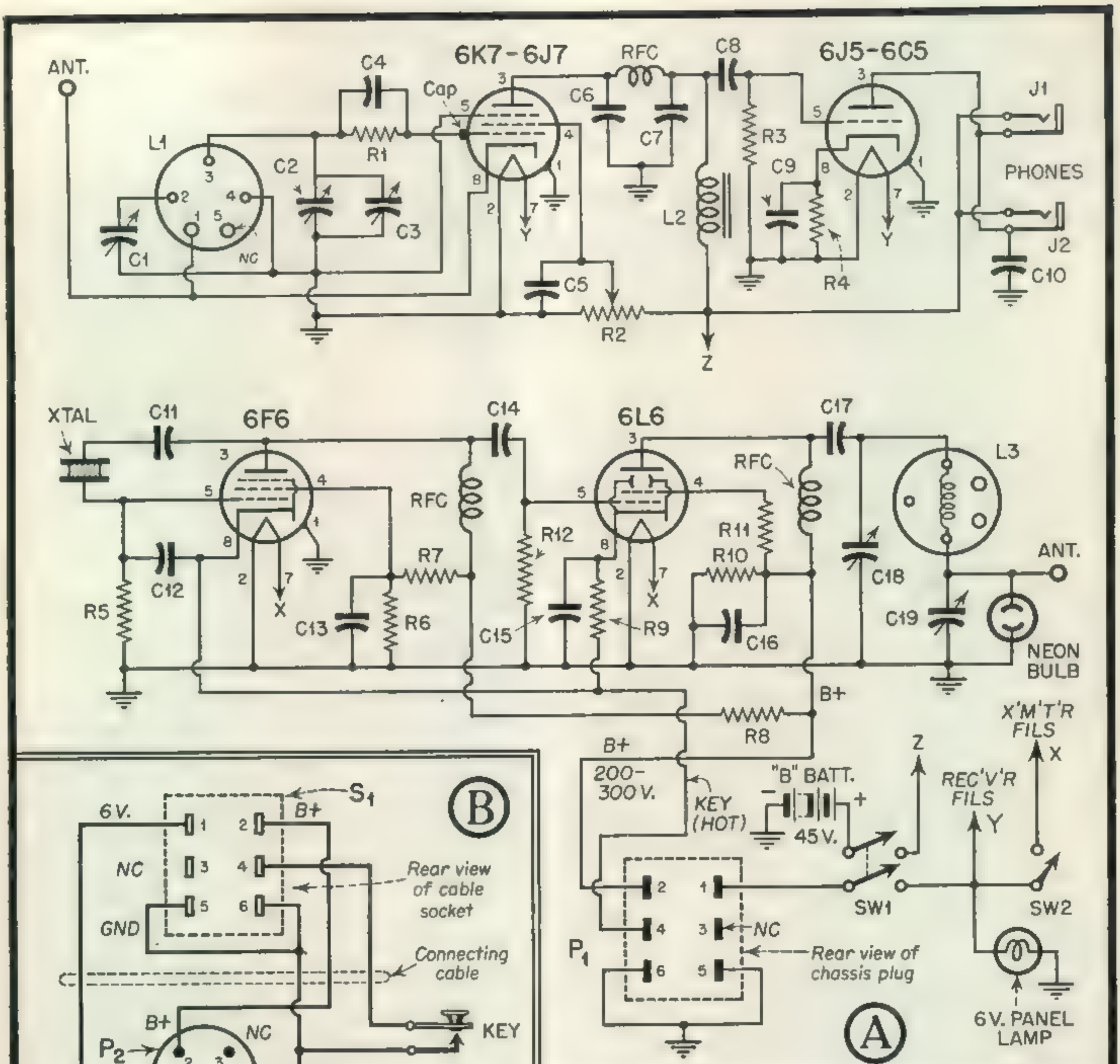
Antenna system—Must be simple and effective—maybe a long wire.

Size and weight—the latter not much of a point, but size was a real factor.

But in this spring of 1946 a feller just couldn't make up a bill of material and then go down to the corner ham store and buy all the parts as he wanted—and—per any spec! So it was decided to make up a "junk-box portable," utilizing a lot of the gear that had accumulated during all these many years. You know how it is–"Now–I'll put this little item away for a rainy day—!" *This* was obviously that long awaited rainy spell!

A somewhat dilapidated metal cabinet was "scrounged" and as it looked promising, a rig was laid out and put into it. Fortunately, the cabinet was of a size (12½" wide, 8" deep and 7" high)

**23 River Glen, Farmington, Conn.*


ANT.
C4
6K7-6J7
RFC
C8
6J5-6C5
Cap
C6
J1
L1
C2
R1
C7
R3
PHONES
C9
C1
C3
NC
L2
J2
C10
C5
R2
R4
Z
Y
XTAL
C11
6F6
C14
6L6
C17
L3
RFC
R12
R11
R7
R10
C18
ANT.
R5
C12
C13
R6
C15
R9
C16
C19
NEON BULB
B+
R8
X
B+
200-300 V.
KEY (HOT)
"B" BATT.
45 V.
X'M'T'R FILS
REC'V'R FILS
SW1
SW2
NC
Rear view of chassis plug
6 V. PANEL LAMP
S1
6 V.
B+
NC
GND
Rear view of cable socket
Connecting cable
KEY
P2
Pin view of cable plug
B- GND
S2
Base view of socket
VIBRATOR PACK
"A" HOT
SW3
300 V. FILTERED D.C.
S3
15 A. FUSE
6 V. BATTERY
TRANSMITTER POWER SUPPLY AND PRIMARY SOURCE CONNECTIONS
P3
L1
Pin views of coil forms
L1 3.5 Mc. BAND
24 T. No. 22 D.S.C. close wound.
Cathode tap ¾ turn from ground.
7.0 Mc. BAND
10 T. No. 22 D.S.C. spaced to 1" long. Cathode tap, ¾ turn.
14 Mc. BAND
6 T. No. 20 E. spaced to 1" long.
Cathode tap, ¾ turn.
L1 BROADCAST BAND
90 T. No. 28 D.S.C. close wound.
Cathode tap, 3 turns from ground.
All coils wound on 1½" dia. forms.

that proved adequate or this yarn might never have been spun. The box was of the screw-on panel type so an aluminum panel and chassis were made up, and a 2½-inch space was left beneath the chassis. A lip was made on each end of the "L" chassis so that the front, or long side of the L could be bolted to the panel and the lip on the 2½-inch apron could be fastened to the bottom of the box when the unit was completed and ready to install.

The Circuit

The receiver was destined to be another of that variety of ever-popular and sure-fire "two-tube bloopers"—a regenerative detector (with plug-in coils) followed by a triode amplifier. Bandspread was available through the use of the familiar "bandset-bandspread" combination using large and small variable capacitors in parallel. In addition, a large variable was included and connected so that when the broadcast band coil was plugged in, this variable would tune that band. The resultant signals would furnish the required amount of jive, news, "chamber-music" and even a modicum of Eddie Cantor and Dinah Shore—when and if needed in the months to come.

While the regenerative receiver has been much maligned, it has long been a favorite of those c-w amateurs fortunate to be removed from local QRM. The transmitter circuit was selected following an intense study of contemporary "lash-ups," plus the fact that the writer had firsthand knowledge of the chosen arrangement's usability. A 6F6 tube in a Pierce crystal oscillator, driving a 6L6 would give an adequate, if not over-powerful, signal when coupled to a fairly good antenna located on top of some mountain. A built-in antenna coupler would save space. The complete schematic is shown in *Fig. 1*, and includes the receiver, transmitter and power supply. Provision was made for operation on the 14 and the 7 mc bands, as well as for the 3.5 mc band. (Actually, all that was necessary for the inclusion of those bands was the addition of the proper coils and crystals—*Ed*) (So I can't get any credit for foresight—huh?) (No!—*Ed.*).

The power supply presented a minor problem. Available was an Electronic Laboratories, Model S-1040, but this unit was not arranged, so that the vibrator could be turned off and the filament circuit left on. A Radiart vipower type 4200 DE pack was secured, on loan, from W1DGG of Milford, Conn., and as it proved very satisfactory, it was used on the 6 volt supply. This pack gave almost 300 volts (under load) of filtered d.c. and could be connected to be instantly available when the power switch was closed.

Cables were made up so that either the EL or the Radiart pack could be used, thus providing for both a-c and d-c operation, since the EL S-1040 can be used on either. Interconnecting cables were insurance that the equipment could be dismantled with a minimum of effort and could be assembled without confusion in the field.

Fig. 1. Schematic diagram of the portable equipment for 14, 7 and 3.5 mc c-w operation from a 6-volt storage battery. (A) Complete diagram of the receiver and transmitter. All grounds are made to the aluminum chassis and panel. See Fig. 3 for physical layout on chassis. Note the connection of the 6K7 detector tube grid, which is made to the cap of the tube. A small metal shield covers the grid after the clip is placed on the tube. The 45-volt "B" Battery is contained in the cabinet, and supplies plate power for the receiver. SW1 cuts this battery out of the circuit when the filaments are off. (B) This depicts the interconnecting cable between the r-f package and the power supply. (C) The vibrator power supply package and the car termination arrangement. The vibrator pack is filtered and has three leads "A Hot," "B Plus" and "Ground." SW3 is a heavy-duty switch and is used to control the 6-volt input to the vibrator pack. (D) Coil table for the receiver.

C1—375 $\mu\mu$f variable BC tuning
C2—15 $\mu\mu$f variable, bandspread
C3—100 $\mu\mu$f variable, bandset
C4, C6—100 $\mu\mu$f mica
C5—0.5 μf paper
C7—250 $\mu\mu$f mica
C8—0.01 μf paper
C9—10 μf electrolytic
C10, C11, C13, C15, C16, C17—0.002 μf mica
C12—50 $\mu\mu$f mica
C14—250 $\mu\mu$f mica
C18—100 $\mu\mu$f variable, tank tuning
C19—250 $\mu\mu$f variable, antenna loading
J1, J2—open circuit jacks insulated from panel
L1—Receiver coil. See table
L2—Audio choke, 500 henry
L3—Transmitter tank coil, Barker and Williamson
B & W Jr.—20-40-80 End Link Coils
P1—Jones 6-prong chassis plug, male
P2—Tube base, 4-prong plug
P3—Jones, 4-prong heavy-duty male cable plug
R1—5 megohm, ½ watt
R2—50,000 ohm pot.
R3—470,000 ohm, 1 watt
R4—2000 ohm, 1 watt
R5, R7—47,000 ohm, 1 watt
R6, R10—100,000 ohm, 1 watt
R8, R11—10,000 ohms, 2 watt
R9—300 ohm, 1 watt
R12—20,000 ohm, 2 watt
S1—Jones 6 prong cable socket, female
S2—Tube socket, 4-prong
S3—Jones 4-prong heavy-duty, female cable socket
SW1—D.P.S.T. toggle
SW2—S.P.S.T. toggle
SW3—S.P.S.T. toggle CH heavy-duty

The Receiver

The receiver worked out exactly as thousands of other "two-tubers" have done in the past. Either a 6K7 or 6J7 (metal) is used. A small shield covers the grid cap, thus eliminating undesirable pickup on the grid. As shown in *Fig. 3*, the receiver is built on the left side of the chassis. An aluminum shield (4 inches high) was fitted around the coil and condensers as shown. This cuts down the pickup of the transmitted r.f. A Burgess Type 5308 45-volt "B" battery was fitted into the rear lefthand corner of the chassis, with the battery lying on its side. This B battery supplies the plate voltage for the receiver, allowing the vibrator pack to be off during reception periods, greatly reducing storage battery drain and providing really quiet reception. The writer has found 45 volts entirely adequate for a receiver of this type, and satisfactory headphone reception on both the amateur and broadcast bands is obtained.

The cathode tap on the coil, *L1*, is also used for the antenna connection in the receiver, and is connected to an antenna post on the front of the panel. In practice, it was found desirable to use the same antenna for both transmitting and receiving (to save work in the field) and so a small porcelain switch (SPDT) was mounted on the front panel. External connections were made to both transmitter and receiver antenna posts. The switch arm is connected directly to the big antenna. However, a short length (10-25 feet) of wire connected to the receiving antenna post will work well, and in some instances better than the longer transmitting antenna, since there is no available means of properly adjusting the coupling to the receiver. In some cases on 14 mc a small (10-25 $\mu\mu$f) capacitor was necessary in series with the normal long-wire antenna lead to the receiver.

The receiver coils are easily wound since only one tap is required. Considerable deviation from the values shown in *Fig. 1D* may be made without trouble. The dimensions as shown are merely a "starter" and experimentation will show the best possible inductance values for each receiver.

The toggle switch, *SW1*, located in the lower center of the panel, controls both the filament and plate power for the receiver as well as the power to the lamp on the front panel. A connection from this switch is made to the transmitter filament switch, *SW2*, so that the transmitter filaments cannot be on without the receiver filaments having been turned on. Thus, when *SW1* is off, the entire r-f package is dead. (Note *SW3*, on the power supply, controls the vibrator pack. This will be covered later.)

The tuning condenser, *C2*, is adjusted by means of a National Type BM dial modified by the addition of a large tuning knob from a National Type A dial. The large knob has the small diameter hole required to fit the BM shaft. This combination makes a very smooth and comfortably operated dial as the larger knob is less tiring and yet may be accurately adjusted.

The amateur bands are located by the proper setting of *C3*, which is then locked and the tuning capacitor will spread the band over the desired portion of the dial. With the inductance and capacities used in this receiver, the bands are spread as follows—14.1-14.2 mc (c-w portion of the 14 mc band) covers about 25 dial divisions; 7150-7300 kc about 80 divisions. On the 3.5 mc band no measurements were taken but it appears that the 3500-3600 kc portion of the band covers about 75 dial divisions.

A dial lock is provided for the bandset condenser, *C3*, so that no undesired turning of the bandset condenser will disturb the setting once it is established for a given band.

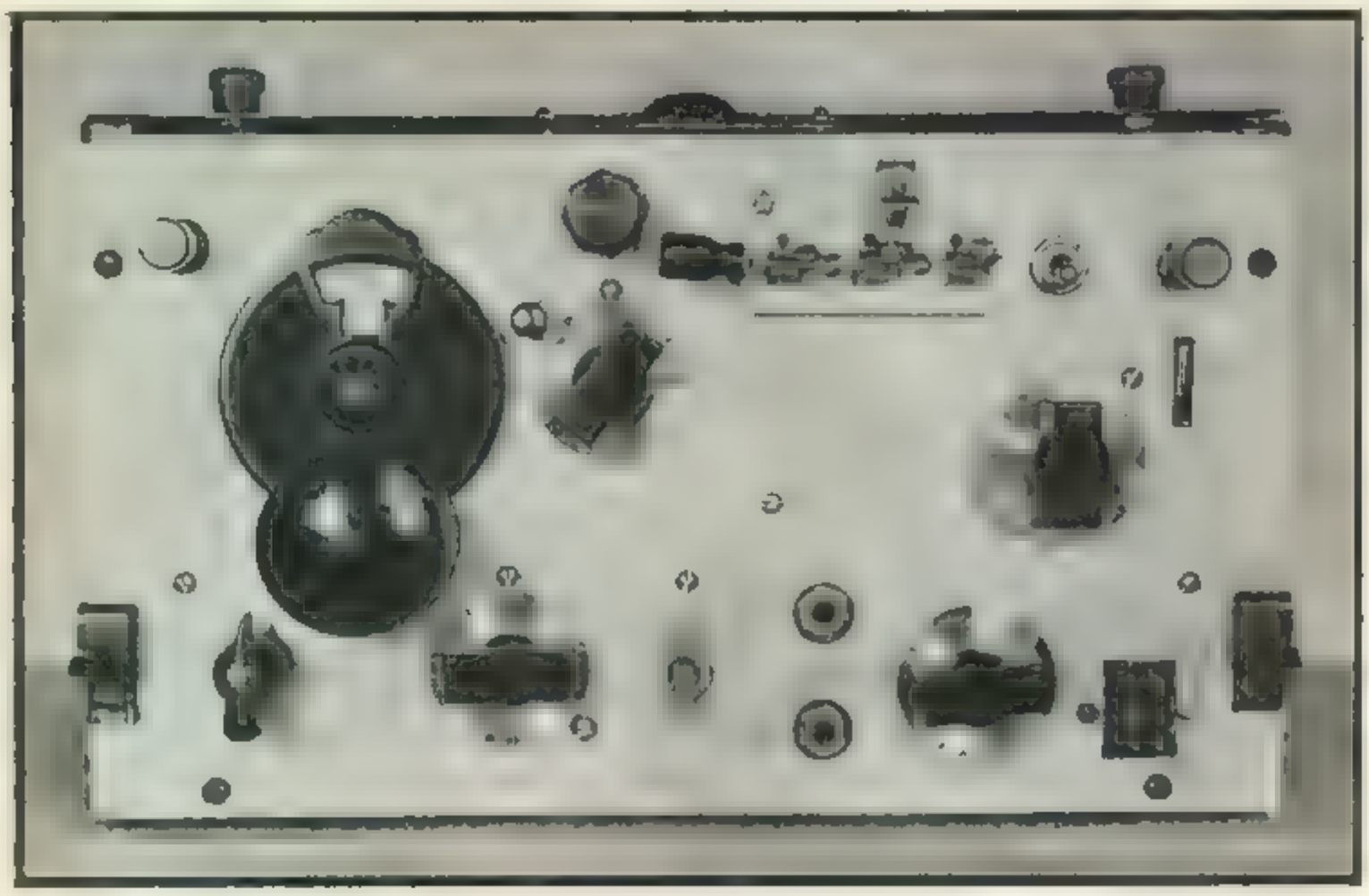


Fig. 2. Front view of panel showing arrangement of components. Note the large tuning knob on the BM dial. A dial lock is provided on the bandset dial. A SPDT porcelain switch is added to provide transmit-receive operation from a single antenna. Jumpers are run between the switch and the two antenna posts. Aluminum panel is 12½" x 7" x 1/16".

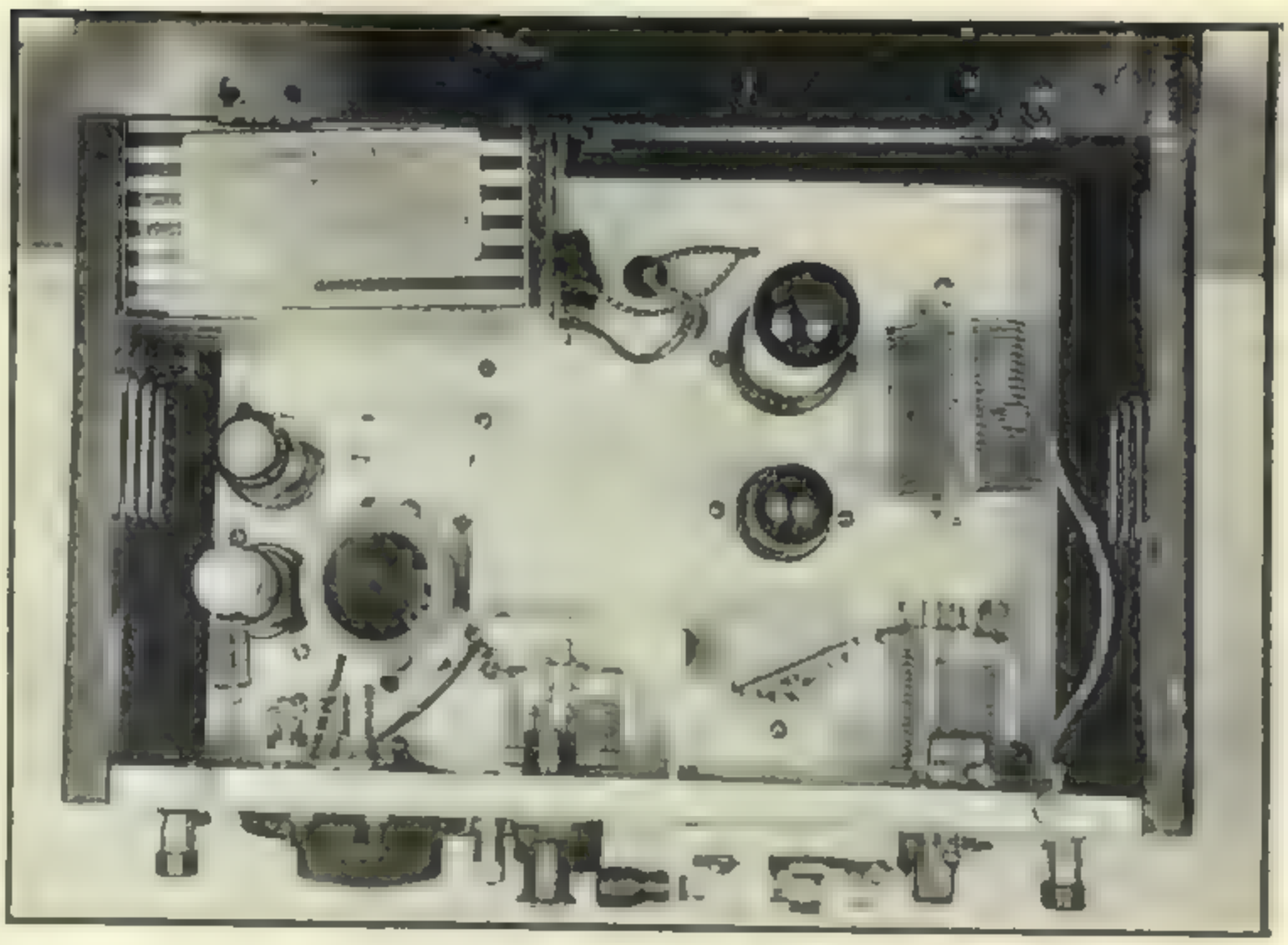


Fig. 3. Top view of chassis showing placement of components. The 45-volt "B" battery is lying on its side on top of the chassis. A bent piece of aluminum shields the coil from excessive transmitter r.f. Placement of the 6K7 permits short and direct r-f leads in the receiver. The crystal socket is towards the front in the transmitter portion permitting easy access when changing crystals. The transmitter tank coil is placed to gain maximum clearance from tubes and cabinet. The *link* end of the coil is towards the front of the chassis. The chassis is 7½" deep and 11" long. A rear apron, 2½ inches high, permits underneath-chassis mounting of many of the components.

The regeneration control, located at the lower left of the panel, is smooth and non-critical on c.w. On 'phone, careful adjustment will bring in strong signals, since the control will hold the detector just below the point of oscillation.

The panel light, a war-developed type, is not satisfactory. Mallory used to make a small hooded light, similar to the ones used on the Ford Model T dashboard, but they were unavailable and so this military model was installed. It simply does not throw the light where it is needed —on the dials. It does a fair job of illuminating the log book or the scratch pad. By using the hand or a scrap of paper as a reflector, sufficient light is obtained for operation of the dials. The dial light facilities of the BM dial were not utilized. Had they been, it would be a decided advantage.

Dual headphone jacks are provided. These insulated jacks are wired so that the sleeves are not at d-c potential until a plug is in place.

The Transmitter

The transmitter components are located at the right side of the chassis as shown in *Fig. 3*. Ample room was available, both above and below the chassis and the components were not crowded. A shunt-fed plate circuit keps the d.c. off the, tank coil and the above-chassis capacitor *C19* as well as the tuning capacitor beneath the chassis. Both condensers are grounded.

A single octal socket was provided for crystals . . . for the new ⅜-inch spaced holder. This was a mistake—one learned too late. Sockets should have been included for the ¾-inch spaced holders, thus a variety of available crystals could have been used. As it is, only ⅜-inch spaced holders can be used and the writer's supply of these is limited. (What *is* a guy going to do with all those one-inch crystals unless he puts in a socket for their holders?)

A small tubular neon bulb is fastened behind the panel by a small metal bracket. The glow of the bulb is visible through a slot cut in the panel. The bracket forms the ground part of the circuit and the wire leads of the bulb are connected to the transmitter antenna post. This is the only tuning device built into the transmitter and it has been found adequate when used in conjunction with an external antenna current device which will be described later. The transmitter was tested, the currents and voltages measured and found to be within satisfactory limits for continuous operation. No damage can result from possible mistuning of the tank circuit.

A toggle switch, *SW2*, controls the filament circuit to the transmitter. This switch is rarely used as the filaments remain heated during operation. However, they are turned off during extended listening periods or when relaxing on the broadcast band.

A male Jones chassis plug, *P1*, located at the lower right corner of the panel forms the r-f package end of the interconnecting cable. It is realized that the protruding prongs might be damaged in handling or in transit, but it was believed desirable to conform to the amateur electrical safety code and to make the cable end the female or socket terminal.

Fahnestock clips are fastened to each side of the front panel and either may be used as a ground post. These clips offer protection to the Jones plug and to the regeneration control knob.

Components and Wiring

The components, selected from those available in the junk box, were all picked for their reliabil-

[*Continued on page 70*]

Tailor-Made Portable for 75

CHARLES W. BOEGEL, Jr., WØCVU*

One Signal Corps set that some fellows will want to see again is this Army rig—an ideal portable for 75 phone or 80 c.w., as WØCVU proved on tests throughout the midwest

THE PURPOSE OF THIS article is to acquaint hams with a really workable portable for 75 meters that gets results with a minimum of effort in both operation and installation. For this announced purpose the writer has chosen the SCR-284A or BC-654A field sets. These can now be purchased at very low cost with the entire station and accessories selling for around $90. The main portion of the unit can be found in certain market places for as little as $35. The beauty of buying the complete outfit is the degree of flexibility obtained.

Pertinent facts about the SCR-284A are as follows: frequency coverage is 3750 to 5850 kc with a 6 tube MOPA transmitter and a 7 tube superhet receiver; maximum power output is 11.2 watts on phone and 24.6 watts c.w.; power requirements are +90, –45 and 1.5 volts d.c. The latter can either be supplied by batteries directly or through a generator set. Frequency stability is well within Class A phone limits.

*℅ *Collins Radio Company, Cedar Rapids, Iowa*

Two 120 amp batteries are used to drive the motor generator set for the SCR-284A. The antenna is coiled in the foreground and is a $6.50 folded dipole. The hemp rope and sash weight are the necessities for raising the antenna above ground.

It has been found that the selection of an antenna is the most important factor in getting the most out of this set. Quite a few antennas were tried at WØCVU before deciding on the final type. We first experimented with vertical antennas from 8 to 25 feet in length. Fair results were obtained with the latter, although no apparent DX beyond 60-75 miles seemed possible. With the 8 foot vertical only the locals within 5 miles could be worked. Some improvement in working the locals can be expected with a 15 foot paratrooper type whip antenna.

An off-center-fed Hertz antenna 118 feet long was tried with a counterpoise and although fair results were obtained this antenna was very difficult to erect and tune properly. Excellent results from a home location were obtained with an end-fed Zepp a full wave long. However, this antenna lacked any degree of portability.

Having settled on the point that a horizontal antenna was necessary, a folded dipole made entirely of 300 ohm twin-lead was constructed. The first one was cut to 120 feet on the flat-top, but it resonated on 4150 kc. Lengthening to 130 feet brought the resonating point to 3950 kc. This antenna does not need any critical retuning for 100 kc either side of this frequency. For best results this antenna should be about 30 to 35 feet high on the ends and at least 20 to 25 feet high in the center. Getting the antenna up in the air in a wooded location may be accomplished with relative ease by following these suggestions. Take a 3 pound sash weight and place a ring in the end. With a coil of ¼" hemp rope about 50 feet long in one hand and the weight clipped onto one end of this coil, it is an easy job to throw or swing the sash weight 30 to 35 feet over a branch of a tree. When it comes to earth, unclip the weight and clip on the antenna insulator. Generally speaking, it is best to try and orient the broadside of the antenna for the direction you will want to work.

Tuning up the SCR-284A is very easy and as a reference to prospective users, we have found that on 3950 kc the selector knob should be set on 3; the oscillator dial to 746 and the antenna dial to about 450 with this type of antenna. The antenna coupling will be about 100. This results

Far from the city noise WØCVU relaxes on a sunny Sunday morning QSO. The entire unit weighs a little over 40 pounds and gives out 11 watts on the 75-meter phone band.

in about ½ ampere into the antenna when everything is to resonance.

The station log for July with about 20 hours spent on the air from various portable locations showed nearly 60 stations contacted with an average report of QSA5 and R7 to R8. Feeling that July is the poorest month for DX on 75 meters we anticipate that in the late fall or early spring our DX range should extend to at least 500 miles.

A note of caution . . . if this rig is to be used as a portable, it is necessary to advise the Radio Inspector in your district beforehand. If you are going to be within the same county it is only necessary to state the city in or near you will be operating. If taking a trip or vacation, it is advisable to allow two or three weeks for your request to the Radio Inspector, giving the approximate locations wherein you plan to operate. Needless to say, this rig should prove exceptionally valuable as an emergency or standby unit.

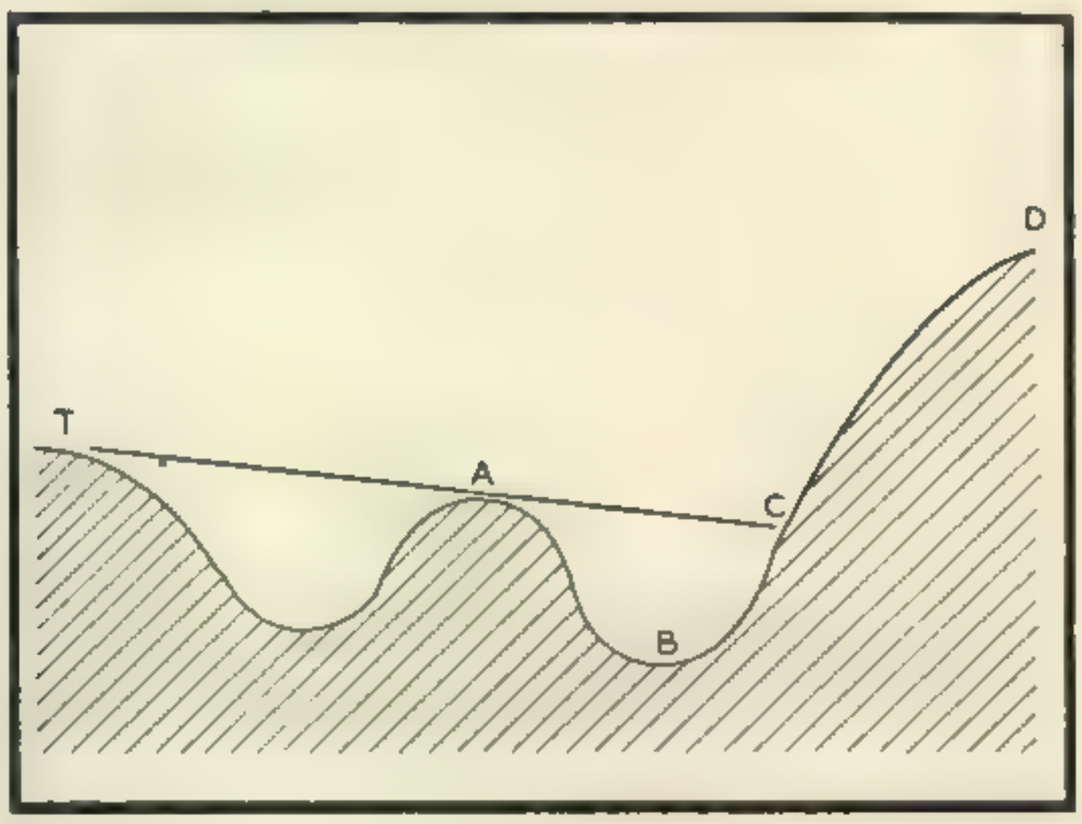
THE BEST POLARIZATION

The question of vertical vs. horizontal polarization on 144 mc is a matter of terrain, according to several British investigators. Sponsored by the National Physical Laboratory, these potential u-h-f DX-ers found that vertically polarized signals were propagated into the shadow of hills more readily than horizontal polarization.

Over terrain equivalent to that illustrated in *Fig. 1* the results are tabulated on page 59. Over the region *ABC* which lies in the geometric shadow of the hill *A* the vertical to horizontal ratio was greatest. In the valley *B* the ratio is particularly pronounced, while on the hilltops the ratio is near unity. Outside of the shadow and ascending from *C* to *D*, the horizontally polarized waves were best received.

The point that should be considered by every v-h-f amateur is that these results are in excellent

[*Continued on page 59*]



The terrain profile of the British wave polarization tests on 3 meters. Vertically polarized waves were received best in the shadow of the hill A, while horizontal polarization was received better between C and D.

Narrow Band FM Exciter

JACK J. BABKES, W2GDG*

Narrow band FM eliminates BCI and provides an inexpensive method of modulating *any* c-w transmitter. Plug the output of this unit into the crystal socket and you're all set for FM phone.

COUNTLESS NUMBERS of amateurs have experienced severe BCI trouble, particularly those using radio telephony. Yet very few have been able to remedy the situation directly at the source, which is the transmitter. A definite cure for this problem on frequencies where permitted, is narrow band FM.

Before discussing this further, let us review exactly what occurs when amplitude modulation is employed. With reference to *Fig. 1*, we see a conventional sinusoidal wave which represents the carrier frequency. In *Fig. 1A*, we have the audio component that will be superimposed on *Fig. 1* and in *Fig. 1B*, the combined signal. It is a known fact that even when operating a transmitter above the broadcast band, nearby broadcast sets are affected directly when modulation takes place. The ham who may be the victim of circumstances beyond his control usually suffers the consequences.

*1776 E. 13th St., Brooklyn, N. Y.

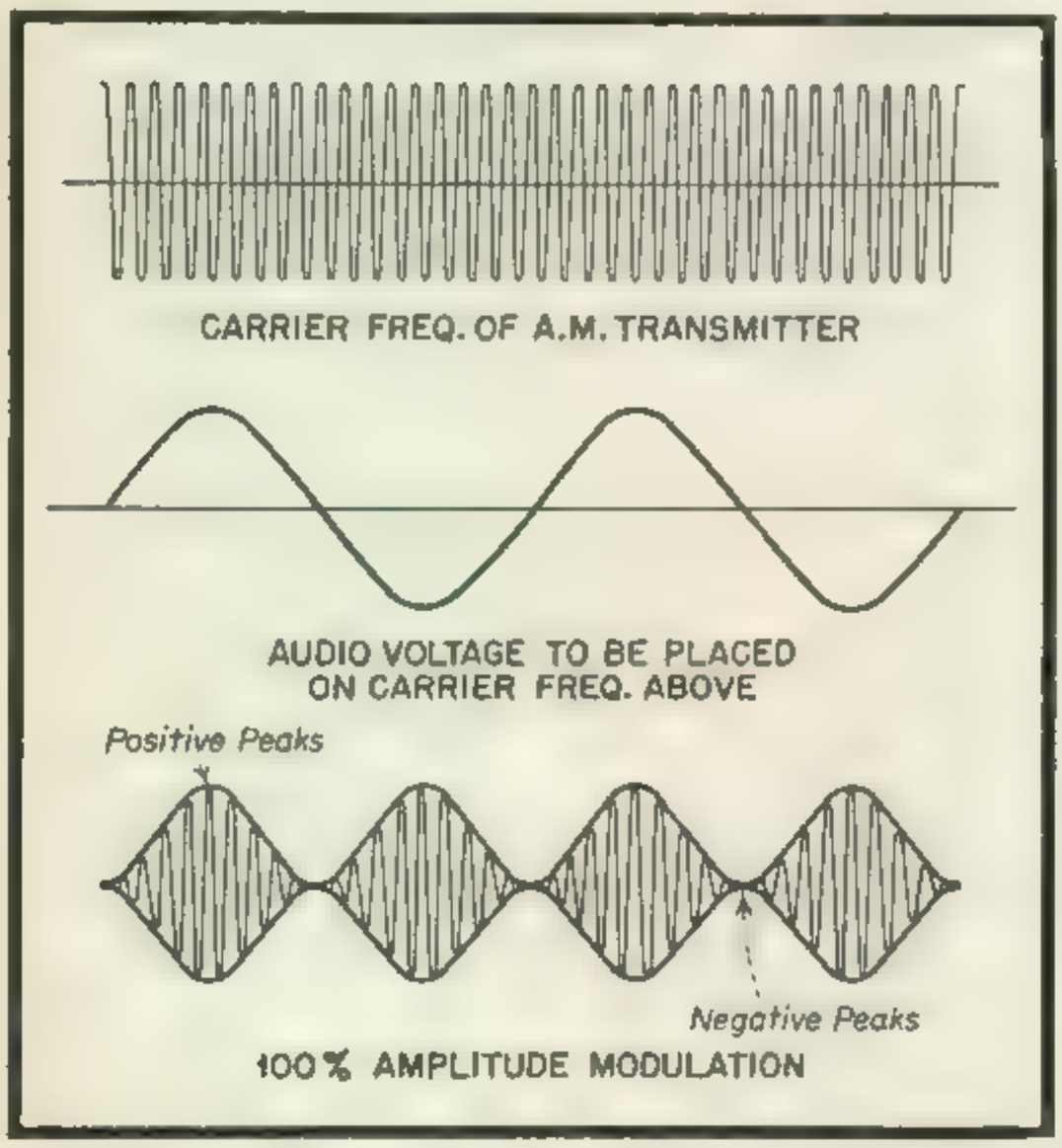
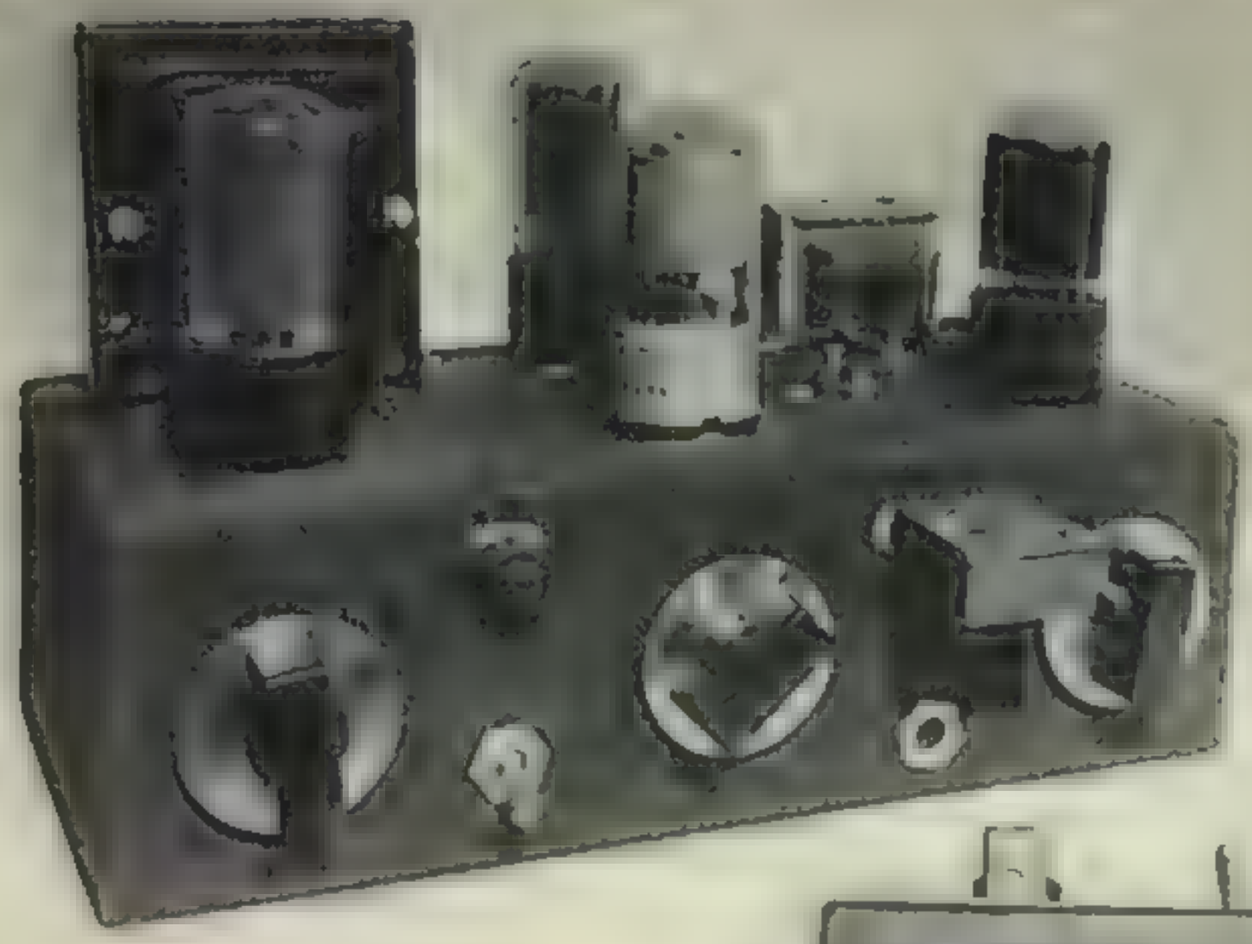


Fig. 1. (top) Carrier frequency of AM transmitter. Fig. 1A. (center) Audio voltage to be placed on AM carrier. Fig. 1B. (bottom) AM carrier modulated 100%.

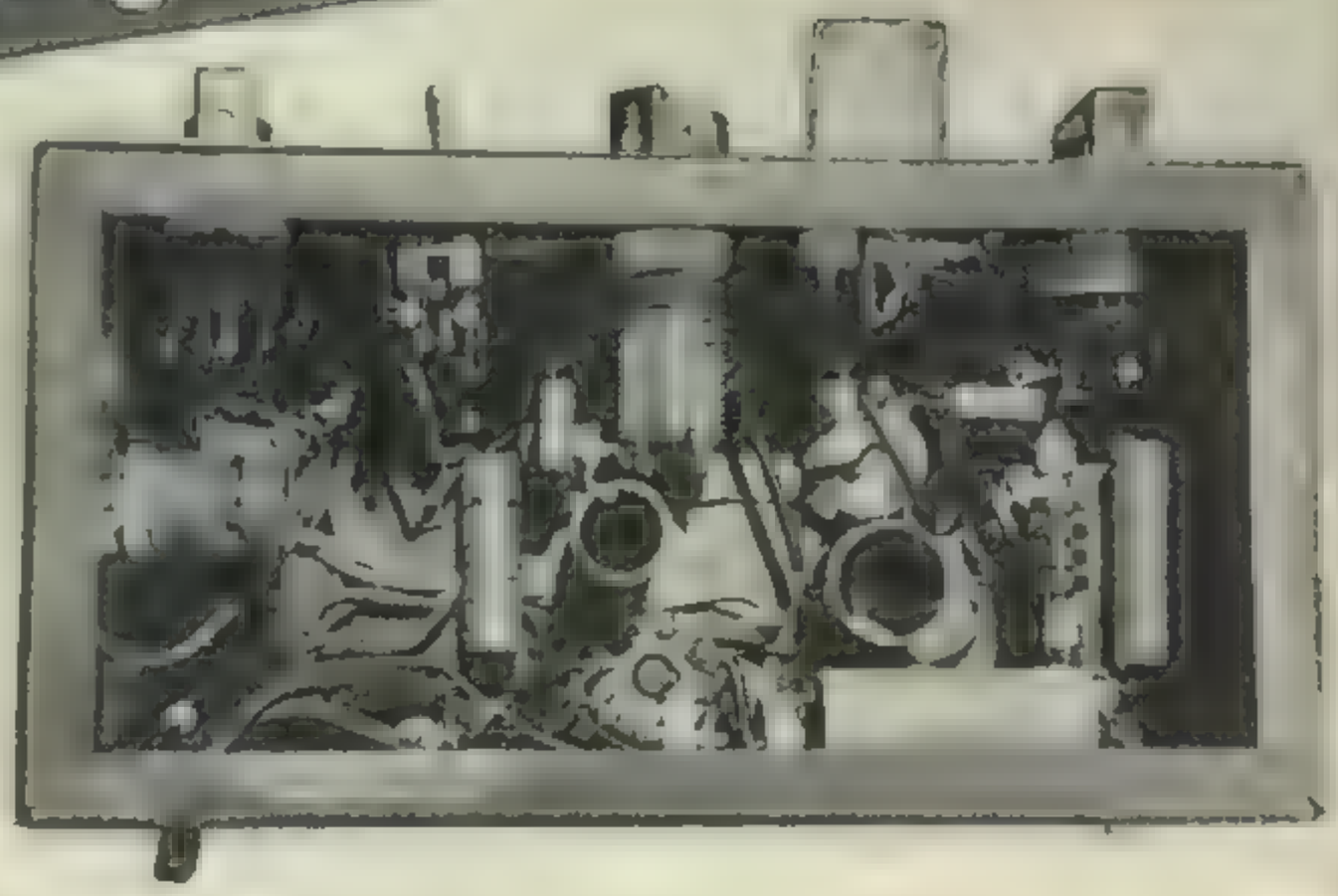
The reason for this is that when amplitude modulating any carrier, an effect similar to shock excitation occurs about a given area. The a.c.-d.c. type of receiver is most affected. There is little that one can do to eliminate the trouble, because the majority of these sets have fairly good gain but very poor selectivity. This also applies to some of the older type a-c operated broadcast sets. The amateur who has been unable to overcome this obstacle usually resigns himself to his fate by keeping "quiet hours" in the evening and depriving himself of the numerous contacts he would ordinarily have. The use of narrow band FM is the practical solution.

In narrow band FM we start out with the same r-f carrier as shown in *Fig. 1*. In *Fig. 1A*, we take the same audio voltage and use it to shift the carrier frequency. The net result is shown in *Fig. 2*. Note that modulation changes only the frequency, not the height, of the peaks. Modulated or not, the amplitude of the carrier is always constant, thereby abolishing the so-called shock excitation. As an illustration, let's go back to the AM transmitter and vary the frequency without modulation by either changing the crystals or varying the v.f.o., whichever the case may be. Doing this, BCI would be practically nil. If you were to amplitude modulate this transmitter it is a certainty that someone nearby would pick you up for the reasons stated. Let us now actually frequency modulate this same transmitter at an audio rate and we have eliminated one of amateur radio's greatest handicaps . . . the highly objectionable broadcast interference.

At present FM is permitted only on the higher frequencies, starting with the 11-meter band, but if enough hams use narrow band FM, the FCC may set a standard for narrow band FM of from approximately 4 to 6 kc which will be equivalent to a 100% modulated AM transmitter. This standard may enable FM phone on the lower frequency bands.



(Left). Front view showing layout of major parts and control. Gain control is at right, oscillator plate control center, and doubler plate control at left.



(Right) Bottom view of FM exciter showing placement of components. Note the relatively few parts required.

While conducting a survey of our own to determine why more hams were not using FM, we found the answer to be lack of frequency stability—normally encountered in the conventional reactance tube modulator circuits. This is so because it becomes a rather costly proposition to use the a-f-c system (described previously in CQ[1]) to approach the stability and features of a crystal-controlled oscillator. The false idea that an FM receiver is required also helps make many hams shy away from FM. The instability mentioned can be remedied by a system that uses direct crystal control such as that employed in a conventional AM, c-w transmitter.

When we speak of FM curing BCI, we are referring to the everyday headache that is found in AM transmitters, due to the modulation from the ham transmitter blocking out the broadcast program. Cross modulation due to mixer or i-f overload or even rectification in the audio using a ten meg resistor, would not take place when using narrow band FM. Assuming the transmitter is properly tuned and has no spurious radiation, the amplitude of the carrier is always constant, and is not radiating any r.f. except the mean frequency and the adjacent sidebands when FM is taking place. Narrow band FM will occupy less space in the radio spectrum as it works on a modulation index of less than one; regardless of the audio frequency, the frequency shift from the mean frequency is proportional to the audio amplitude. Using a modulation index of less than one, the only functional sidebands are the first; all others are of infinitesimal magnitude.

Of course, beat frequencies due to the oscillator in the receiver beating with the output of the transmitter will still take place . . . usually on the lower frequencies such as 40 and 75 meters. We do not claim to cure by the use of frequency modulation, such a rare type of BCI.

Exciter Design

The simplest method of producing FM is the reactance tube modulator[2]. With this system a large amount of deviation can be obtained, but in order to get good frequency control, several expensive and complicated methods are used. One of the easiest, cheapest and yet most effective is to employ a lock oscillator. In such an arrangement we could directly frequency modulate the oscillator which will produce a fair amount of deviation and use the crystal to maintain the frequency. In the schmetic diagram (*Fig. 3*), the 6SA7 tube is connected as a conventional reactance modulator that ties across the 6SK7 tube which is in a conventional e-c-o circuit. The

crystal is connected directly from grid number one to ground. This type of locked oscillator will hold its frequency quite well, however, the locking action between the crystal and the LC circuit is not so rigid that it cannot be frequency modulated a few hundred cycles at an audio rate. Tuned to 80 meters, the plate circuit of the 6SK7 tube drives a 6V6GT tube as a conventional doubler with cathode bias. To use a minimum number of tubes, a 160 meter crystal was chosen, thus giving a frequency multiplication of 16 times when working the ten-meter band. The deviation multiplies as the oscillator frequency is multiplied. If a higher crystal frequency were to be used additional tubes would be required in the audio section in order to get sufficient frequency swing.

Placing The FM Exciter in Operation

The crystals in this model were made and supplied by the Bliley Electric Manufacturing Co. The crystal units are mounted in Bliley's type MC-5 crystal holder. Should 160-meter crystals be difficult to get from your local dealer, it might be possible to get them direct from the manufacturer. After a careful check-up for any possible errors put in all the tubes and select a crystal having a frequency between 1813 kc to 1856 kc, which corresponds to the 10-meter FM allocation from 29,000 kc to 29,700 kc. In reality, 1813 kc when multiplied 16 times will equal 29,008 kc, allowing enough margin for slight discrepancies in the crystal frequency. The same applies for the 1856 kc, which corresponds to 29,696 kc.

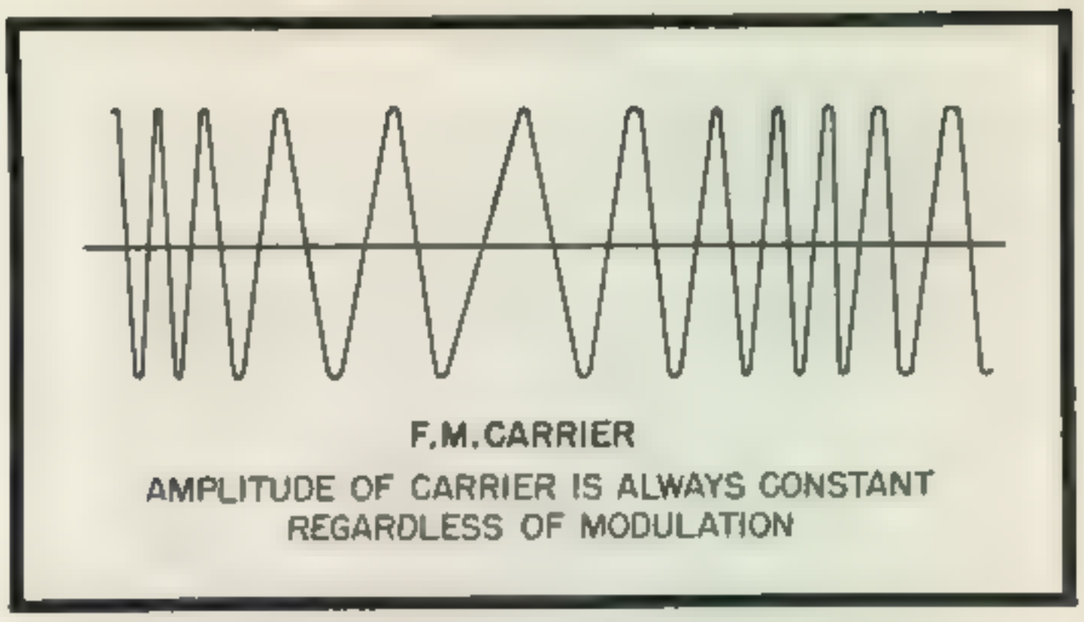


Fig. 2. Typical FM carrier.

Allow the unit to warm up and tune your receiver to the 10-meter band, corresponding to the crystal frequency when multiplied 16 times. Then shut the a.v.c. off and if the receiver has a selectivity control, put it in the sharp position corresponding to a 4 to 6 kc bandwidth. Put the beat oscillator on and you are ready to check the unit. Connect a 0–1 ma meter in the jack to read the 6V6 at the doubler grid current. Tune the oscillator plate condenser for maximum grid current, which should run between .2 to 1 ma. If a small bulb is available, place it near the 6V6GT-doubler plate coil and tune for maximum brilliance.

You will notice that when tuning the condenser in the doubler stage, two positions will be found indicating resonance, (1) where the condenser is a quarter-way out and (2) when the condenser is three-quarters out. The proper point corresponding to the fourth harmonic is when the

[*Continued on page 60*]

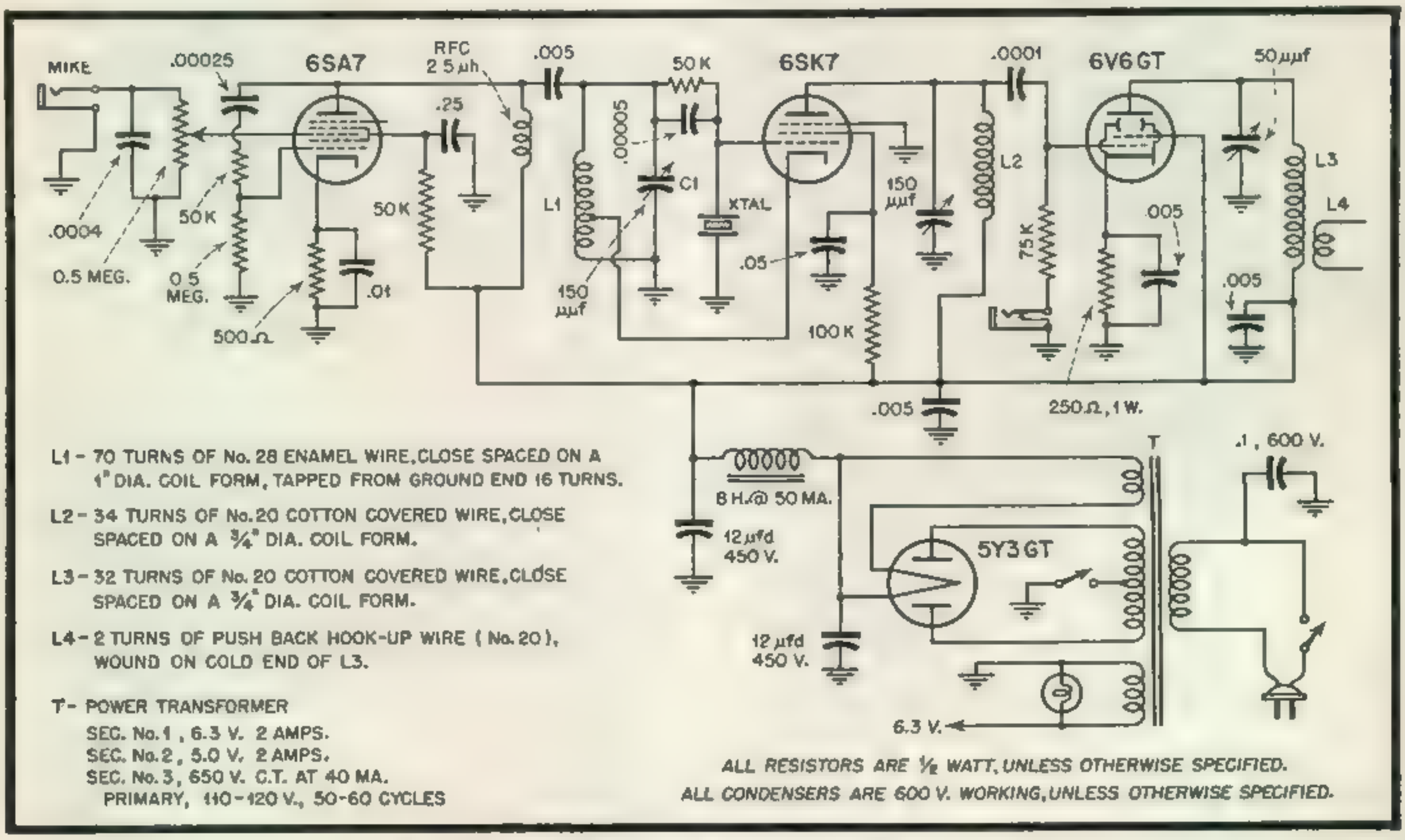


Fig. 3. Circuit diagram of narrow band FM exciter.

Sluggish Crystals?

A sluggish crystal oscillator oftentimes requires a small amount of feedback between plate and grid to sustain oscillations, and most hams find that the several micromicrofarads necessary to obtain this feedback can be obtained by twisting two pieces of insulated hook-up wire together. The actual capacity of this homemade condenser is often dubious and the entire arrangement is rather unsightly.

Several inches of any of the three varieties of Amphenol Twin-Lead transmission line can be substituted for the twisted pair, since the capacity per foot for the 75 ohm line = 19 $\mu\mu$f, the 150 ohm line = 10 $\mu\mu$f, and the 300 ohm = 5.8 $\mu\mu$f, Merely chop off a few inches leaving one end free and connecting one wire of the other end to the oscillator plate terminal. The other wire is tied to the grid of the tube. A small amount of lead at a time may be snipped off the free end until the feedback "condenser" is the minimum value necessary to perk the oscillator into activity. Always turn off the B+ when shortening the line, since a short circuit to ground will result when the steel pliers go through the Twin-Lead if the juice is left on.

Robert L. Rod, W2KVY

INTERNATIONAL POSTAGE RATES

FOR THE BENEFIT of all amateurs who desire current information on international postage rates, the following data have been obtained from the Post Office Department. DX men will find delivery of cards greatly facilitated by always using the proper amount of postage.

Letters

For any destination specially named in the table, the postage rate is 3 cents each ounce; for all other foreign destinations, 5 cents for the first ounce and 3 cents each additional ounce. While definite weight restrictions are imposed under these rates, they are of no concern when mailing ordinary letters.

Post Cards

Single post cards for any destination specially named in the table require 2 cents postage; for all other foreign destination, 3 cents. *Maximum dimensions:* 6 by 4¼ inches. *Minimum dimensions:* 4 by 2¾ inches. Each half of a double or reply-paid post card must be fully prepaid the rate applicable to a single card. International post cards with reply paid shall have on the front, in the French language, as the heading on the first part: "Carte postale avec réponse payee" (postal card with reply paid), and "Carte postale réponse" (reply post card) on the second part.

International Reply Coupons

A "reply coupon" may be purchased (price, 9 cents) at post offices, which, upon presentation at a post office in any of the countries of the Universal Postal Union except Nicaragua, Italy, and Vatican City State, will entitle the person presenting the coupon to receive (without charge) postage stamps of that country of sufficient value to prepay any ordinary letter of the first unit of

POSTAGE TABLE

Country	
Argentina	Newfoundland (including Labrador)
Bolivia	Nicaragua
Brazil	Panama
Canada	Paraguay
Chili	Peru
Colombia	Rio de Oro[1]
Costa Rica	Salvador, El
Cuba	Spain, including Balearic Islands, Canary Islands, and Spanish Offices in Northern Africa[2]; also Andorra via Spain
Dominican Republic	Spanish Guinea[3]
Ecuador	Uruguay
Guatemala	Venezuela
Haiti	All other foreign destinations.
Honduras (Republic of)	
Labrador (see Newfoundland)	
Mexico	
Morocco (Spanish Zone)	

[1]Villa Cisneros, Cabo Juby, La Aguera, and Cabo Blanco.

[2]Ceuta, Melilla, Tangier, Alhucemas, Chaferinas or Zafarani Islands, and Penon de Velez de la Gomera.

[3]Rio Muni and the Islands of Fernando Po, Annobon, Elobey, and Corisco.

* * * * * * * * *

(As we go to press information has arrived indicating there may be some drastic downward revisions in International air mail postage rates in the near future. Amateurs using air mail should keep informed of these developments by contacting the local post office)

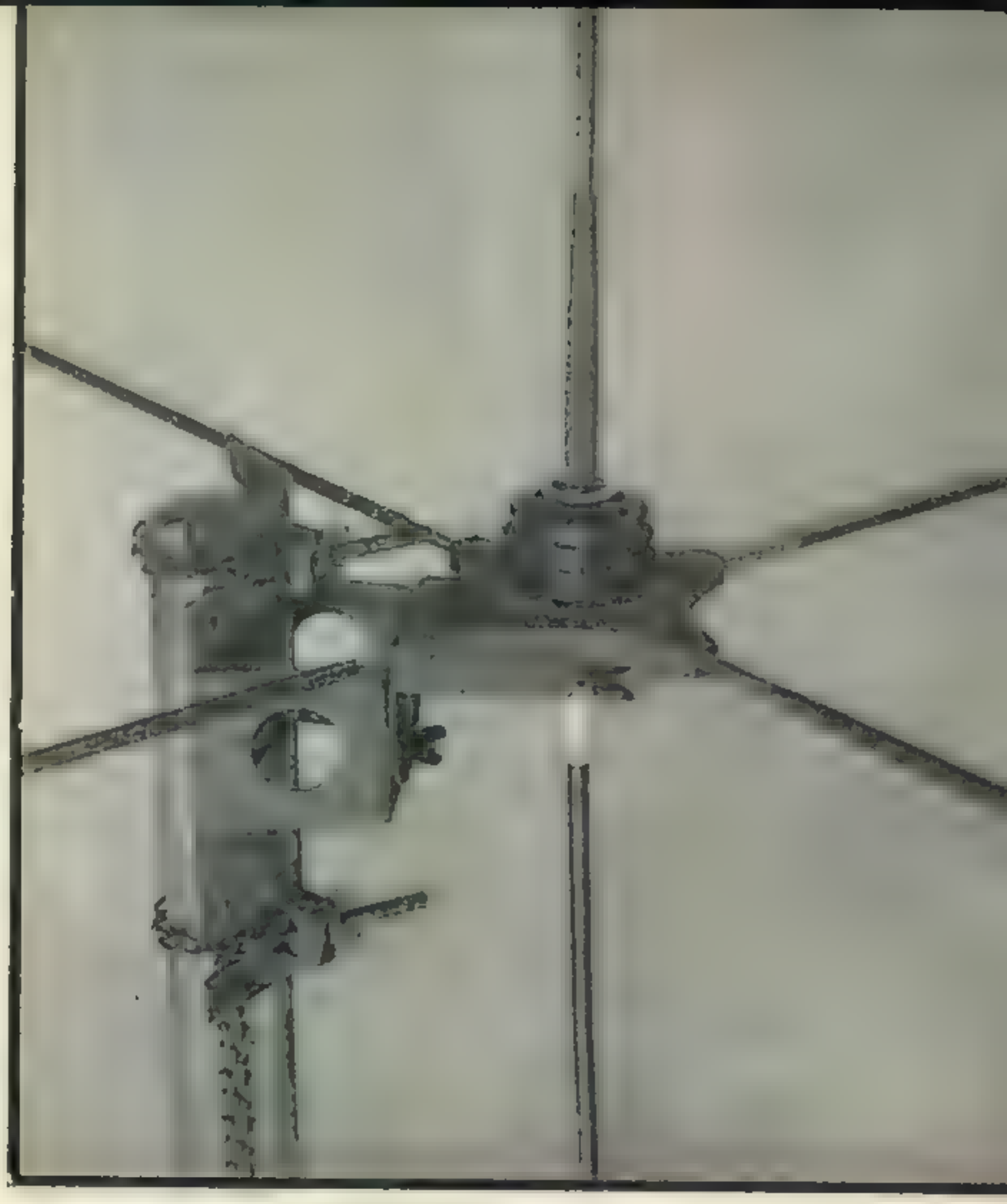
weight from the country of origin of the letter addressed for delivery in this country. By this arrangement a person in the United States can furnish his correspondent abroad with a postage stamp with which to prepay postage on a reply to his letter. The period of exchange is not restricted.

Air-Mail Service

Service is available to most foreign countries. Rates are listed in the table of air-mail rates. While this list does not accurately reflect service available at the present time, in most instances an air-mail letter or QSL card will go at least a portion of the trip via plane.

AIR MAIL RATES

Destination	Rate per half-ounce (cents)
Aden	70
Afghanistan	70
Albania	30
Algeria	33
Anglo-Egyptian Sudan	70
Angola (Portuguese West Africa)	60
Argentina	20
Australia	70
Austria	30
Azores	30
Bahamas	10
Bahrein	70
Barbados	10
Belgian Congo	60
Belgium	30
Bermuda	10
Bolivia	20
Brazil	20
British Cameroons	60
British Guiana	15
British Honduras	10
British Somaliland	70
Brunei	70
Bulgaria	30
Burma	70
Canada (per ounce)	08
Canary Islands	40
Cape Verde Islands	55
Ceylon	70
Chile	20
China (*wt. limit, 2 oz.*)	70
Colombia	15
Corsica	33
Costa Rica	10
Cuba	08
Curacao: Curacao Island, Aruba, Bonaire, Saba, St. Eustatius, St. Martins	10
Cyprus	70
Czechoslovakia	30
Dahomey	45
Denmark	30
Dominican Republic	10
Ecuador	15
Egypt	70
Eritrea	70
Estonia	30
Ethiopia	70
Falkland Islands	20
Faroe Islands	30
Federated Malay States	70
Fiji	40
Finland	30
France	30
French Cameroons	60
French Equatorial Africa	60
French Guiana	15
French Guinea	50
French Settlements in India	70
French Somaliland	70
French Sudan	50
French Togoland	45
Gambia	50
Gibraltar	30
Gold Coast Colony	50
Great Britain and Northern Ireland	30
Greece	30
Guadeloupe	10
Guatemala	10
Haiti	10
Honduras (Republic of)	10
Hong Kong	70
Hungary	30
Iceland	30
India, British	70
Iran	70
Iraq	70
Ireland	30
Italian Somaliland	70
Italy (continental only)	30
Ivory Coast	50
Jamaica	10
Kenya and Uganda	60
Latvia	30
Lebanon, Republic of	70
Leeward Islands: Anguilla, Antigua, Barbuda, Dominica, Montserrat, Nevis, Redonda, St. Kitts, British Virgin Islands	10
Liberia	50
Libya	33
Lithuania	30
Luxembourg	30
Macao	70
Madagascar	30
Maderia Islands	30
Malay States (Nonfederated)	70
Malta	30
Manchuria (*wt. limit, 2 oz.*)	70
Martinique	10
Mauritania	45
Mauritius	60
Mexico	08
Morocco (British)	33
Morocco (French)	33
Morocco (Spanish)	33
Netherlands	30
Netherlands Indies	70
New Caledonia	40
Newfoundland	15
New Zealand	50
Nicaragua	10
Niger	45
Nigeria	50
North Borneo	70
Norway	30
Nyasaland Protectorate	60
Palestine	70
Panama	10
Paraguay	20
Peru	15
Philippines	50
Poland	30
Portugal	30
Portuguese East Africa (Mozambique)	60
Portuguese Guinea	50
Portuguese India	70
Portuguese West Africa (*see* Angola and Portuguese Guinea).	
Reunion	30
Rhodesia (Northern)	60
Rhodesia (Southern)	60
Rio de Oro	40
Rumania	30
Salvador, El	10
Sarawak	70
Saudi Arabia	70
Senegal	45
Siam	70
Sierra Leone	50
South-West Africa	60
Spain (including Spanish offices in North Africa)	30
Spanish Guinea	50
Straits Settlements	70
Surinam	15
Sweden	30
Switzerland	30
Syria	70
Tanganyika	60
Trans-Jordan	70
Trinidad	10
Tunisia	33
Turkey	70
Union of South Africa	60
Union of Soviet Socialist Republics	30
Uruguay	20
Vatican City State	30
Venezuela	15
Windward Islands: Grenada, Grenadines, St. Lucia, St. Vincent	10
Yemen	70
Yugoslavia	30
Zanzibar	60



Particularly popular because it keeps the same relative position in respect to ground regardless of height above one wavelength, the ground-plane antenna is simple to construct and operate.

DEPARTMENTS

- *Monthly DX Predictions-October*
- *CQ DX*
- *YL'S Frequency*
- *UHF*
- *Parts and Products*
- *Postscripts and Announcements*

Monthly DX Predictions - - - OCTOBER

OLIVER PERRY FERRELL*

DX NOTE OF THE MONTH
6 Meters should open in late October from Hawaii to San Francisco area around 1530 hours PST.

THE October outlook for DX is particularly inviting. As the transition from summer to to winter conditions progresses, a certain point is reached when all bands above and including 10 meters are open daily to all continents. For the Fall of 1946, October is that month.

On the East coast of the United States and Canada, the Europeans from the eastern Mediterranean area are expected to break through as early as 0730 EST on 10 meters. A little after 0800 EST they will be joined by the western Europeans. This condition is illustrated in *Fig. 1* and may also be applied to W1, W2, W3 and W8. In using the prediction graphs, the top edge of the variable white area denotes the maximum usable frequency (MUF) over the prescribed path for an average day during the month of October. The lower edge of the variable white area corresponds to the optimum working frequency (OWF). The latter indicates that, in *Fig. 1* for example, 10 meters will on an average day be open from 0830 to 1330 hours EST. Or if considering 13 meters, the band will be open from 0530 to 1600 hours EST. The general 3.0 mc difference between the MUF and OWF at any one time is the area of unstable signals, where under the best conditions we may expect to find 10 meters open from 0630 to 1430 hours EST. Some daily variation in the band opening and closing times is to be expected, but generally if planning a DX schedule it is best to keep to the limits of the OWF scale and be on the safe side. Sporadic increases in the MUF are also to be expected from time to time; these result from unpredictable sunspot activity and certain types of ionospheric layer formations. The slight shading arising from the bottom of the graph is due to the absorption of radio signals. Absorption is exceptionally variable from day-to-day and is only illustrated in its minimum extent to arrest the impression that 40 and 20 meters would be wide open as indicated when only considering the OWF outline. Therefore, in *Fig. 1* we should not expect European contacts on 20 meters between 0900 and 1230 hours EST and on 40 meters between 0700 and 1500 hours EST.

The South Africans are also going to be very strong during October with excellent signals predicted on 10 meters between 1030 and 1400 hours EST. It is quite likely that the stronger stations will be heard and worked as far west as W5 and WØ around 1200 hours CST.

Transcontinental contacts will begin on 10 meters around 0830 hours EST and should last

[*Continued on page 48*]

**Propagation Editor, CQ*

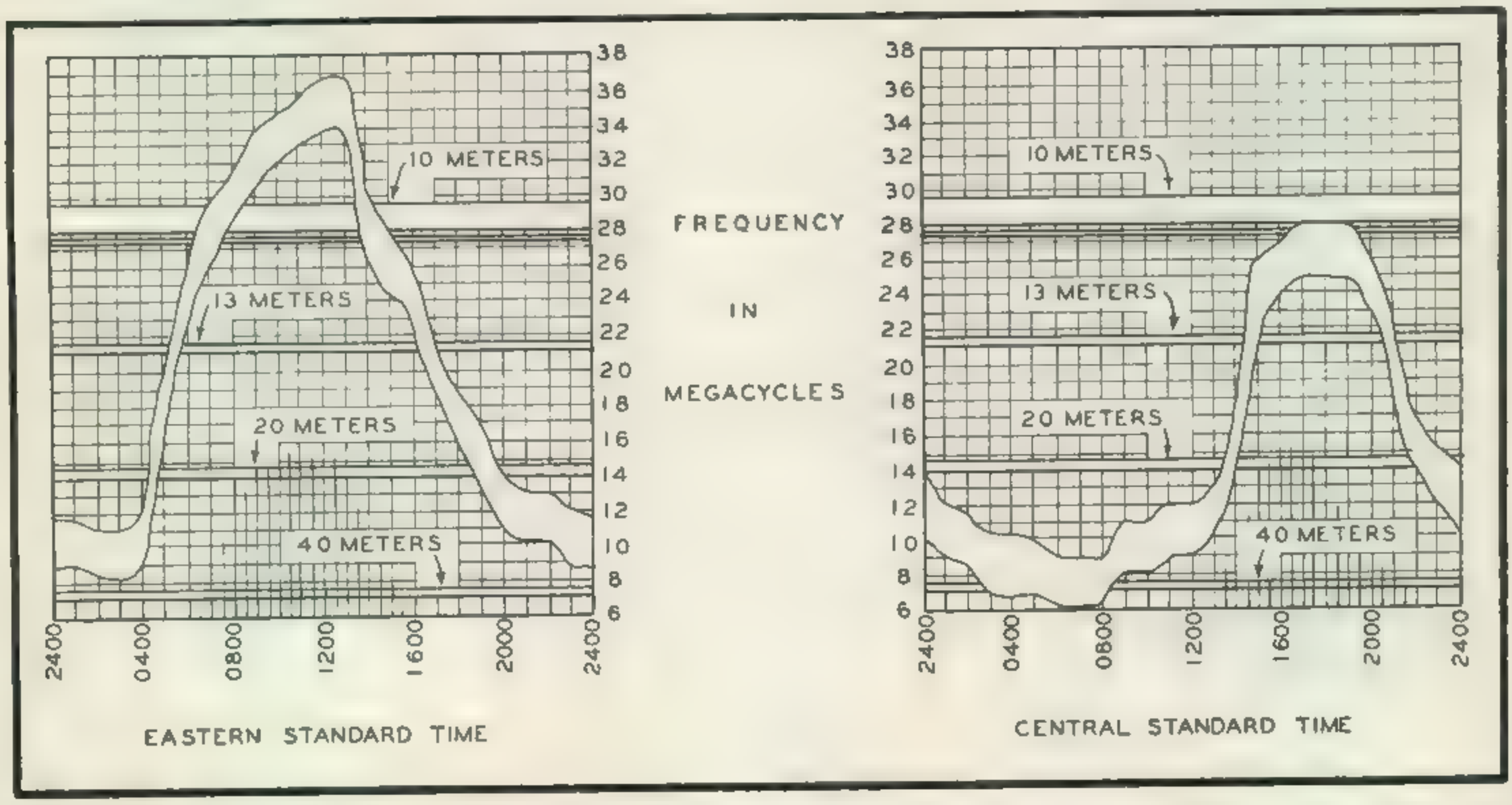


Fig. 1 (left). MUF East Coast to Europe. October 1946 Average. Fig. 2 (right). MUF Chicago area to Japan. October 1946 average.

CQ DX

By HERB BECKER, W6QD

[*Send all contributions to Herb Becker, 1406 South Grand Ave., Los Angeles, 15, Calif.*]

THIS 20 METER BAND is really something, especially from 14,100 to 14,101.5 kc. I'd like to be in some foreign country for about a week and see exactly how many calls I could identify in the first 1.5 kc of the c-w band. Every night is just like one of those old-time DX contests that generally boils down to a "dog eat dog" melee. There is a certain amount of intrigue in simply listening to portions of this band . . . as soon as some foreign DX station tosses out a CQ there seem to be about 500 W's after him. Probably the best remedy is to get more fellers in other countries on the air . . . the ratio will then change. The technique in working DX on 20 doesn't seem to involve so much skill, power, and antennas as it does just plain luck and endurance. (After making that crack I can visualize plenty of you fellows hopping right down my throat). Oh, well, figure it out yourself. Anyway, QD could use a little luck, too.

I understand W1FH, W8BKP, and G2PL are both over the 100 mark, post-war. W2GWE has over 75, but doesn't know how much over. W2IOP worked ET3Y, whose address is Box 1191, Addis Ababa, Ethiopia and ZC4NX, Box 360, Cairo, Egypt. He also worked PX2LD just outside of 14,100, who says he is in Monaco. Then there is OY3G, Thorshaven, Lansgate 10, Faroe Islands. He is approximately 14,080. By the way, Larry had some QSL cards made for EL4A, and they are now on the way to him, so you fellows should be getting yours very shortly. I don't know how you are going to get a QSL from SU1US because he says he doesn't keep a log. And did you know F1F is near Paris? Then, too, the Channel Islands will now have the prefix GC. For those who have worked VO2RM, and who feel like a QSL, you can send yours to Russ Mack, American Over-seas Airways, Gander, Newfoundland. W2GSC and W2JIH have both worked ZC1AR on phone, while W2GWE worked C3YW, VS7ES. Incidentally, W2RPZ, Ed. Newman, a friend of Larry's W2IOP, just got his ticket the other day, and of all things, his first QSO was with F8UZ. Now that's what I call starting out as a DX man. W2OOS has had a number of contacts with EZ4X in Saar, on 7115 and 14350. OOS is running a kw to a pair of 810's.

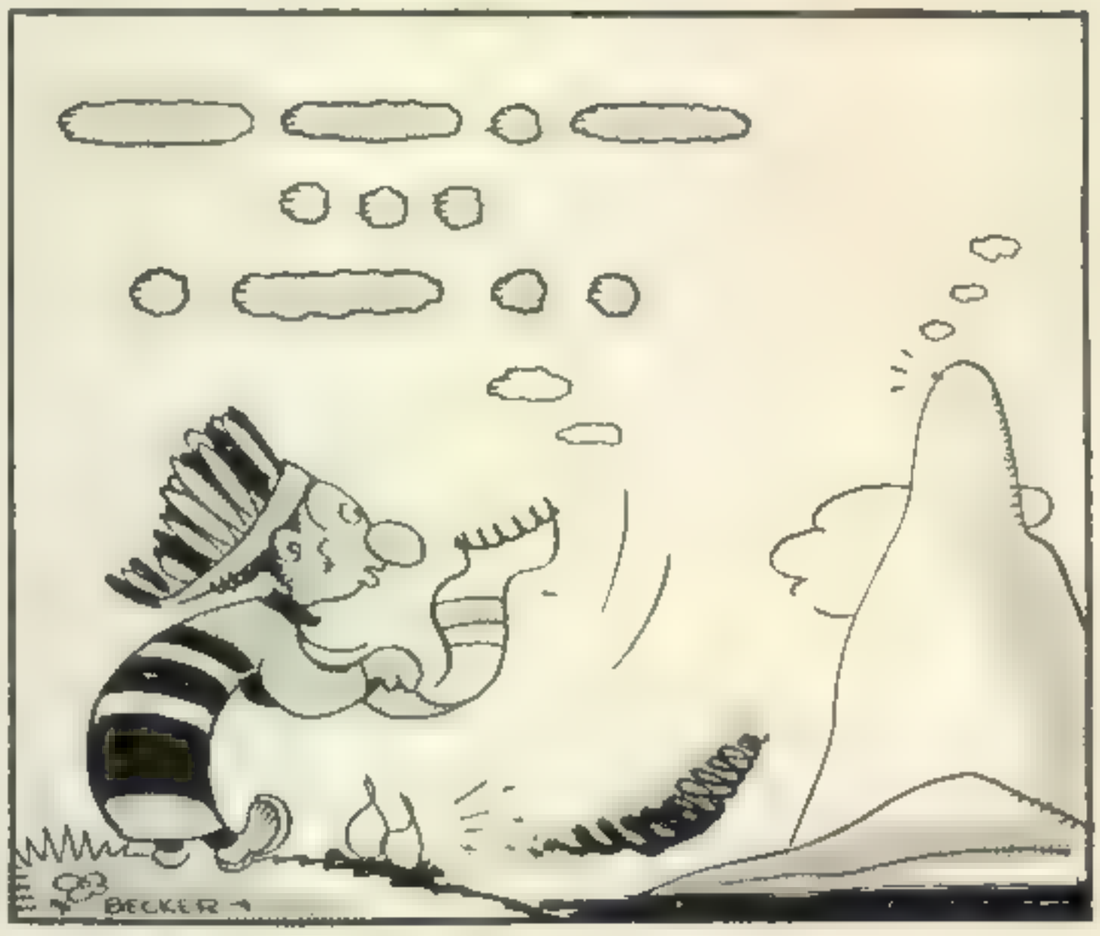
A very interesting letter was received from Bob Jardine, G6QX. He lists some rare DX, which includes PZ1FM, W1NEW/J, KP4AN, CO2BZ, OA4X, W6KIP, W6DJI, W6AYZ, and W6CEM. The reason for the 6's is because up to now they have been rare for him. The QTH of PZ1FM is:

PZ1FM, Box 118, Paramaribo, Dutch Guiana, 14108;

KP4AN, Box 7109, Santurce, Puerto Rico, 14125;

OA4AX, Douglas Flense, Pan-American Airways, Lima, Peru, 14070.

Bob also says he is using an antenna which is really a "winner," and credit for this single wire-fed antenna should go to VS1AA. For 68 or 138 feet, the flat top should be of 80 mil wire; the feeder is of 36 mil wire tapped exactly ⅓ the distance from one end. This antenna, Bob says, is good for 28 mc,



14 mc, 7 mc, and 3.5 mc, with the efficiency falling off slightly on the latter two. The flat top length should be figured by the regular formula for half waves. Then too, there should be no sharp bends in the feed line. Bob states that if any of the fellows want to try a 33 foot flat top of 80 mil wire, the feeder should be of 48 mil instead of the 36. G6QX is running 150 watts into a single T125.

In another letter from Bob to W2IOP he relates that he lost all of his books and magazines during the war, likewise his zone map. His pre-war totals were 96 and 35, while his post-war, his letter whispers, is 20 countries.

G6QX had very sad news that good old Johnny Hunter, G2ZQ, died in Ceylon, from pneumonia. Johnny was Wing Commander, Royal Air Force, and there shouldn't be a DX man that doesn't remember G2ZQ as the best DX man in England. Johnny was one of the few who worked all zones and could always be counted upon for a darn good QSO any time. He was the kind of DX operator who could uncover an RST 229 signal under a flock of 599 locals. His fist will certainly be missed. I know, by the DX gang, as Johnny really could rattle that bug.

Some of the old-time "G" stations on the air include G6CL, G6WY, G6NF, G6CJ, G5BJ, G2MI, G6DH, etc. A lot of newcomers to the DX fraternity are on the air, using quite a bit of what Bob terms as "American speech." I suppose by this he means the so-called American slang. Some of the old-time "G's" may not particularly like this, but I honestly believe they will be able to live through it satisfactorily.

G3LB finished his transmitter the latter part of April, using a co-ax fed antenna on 10 meters. He was successful in raising ZB1E, XACD, D4AJX . . . all on phone. Maybe this doesn't seem particularly remarkable but G3LB was using this antenna indoors just beneath the rooftop. On 20 meters, and with an outside antenna, he has worked UA3AW and UA1RX. The transmitter in use at G3LB

winds up with a pair of T20's, the output being 100 watts.

Latest info' from OK1AW tabulates the frequencies of operation for different class licenses. Class "A" . . . phone on 3.85 to 3.95 mc; 14.14 to 14.25 mc; and 29 to 30 mc. Allowable input is 100 watts. Class "B" . . . phone on 3.85 to 3.95 mc, c.w. on all bands. Class "C" . . . 1.75 to 2.0 mc, 3500 to 3635 kc, c.w. only, with 5 watts input. Following is a breakdown of the bands in use:

1.75- 2.00 mc
3500-3635 and 3685-3950 kc
7.0-7.3 and 14-14.4 mc
28-30 mc
56-60 mc, 112-118 mc, 224-230 mc, 408-420 mc
2300-2400 and 5250-5260 mc
10000-10500 and 21000-22000 mc

Friend George Shields, W2VY/W6 takes me to task for moving their 640 acre NBC short-wave station from *Dixon* to *Davis*, California. All that error in the August column! George informs us that good old DXer, W2UK is now Assistant Station Engineer at the RCA transmitting station in New Brunswick, New Jersey. W2VY, for the time being, is using a BC 610E transmitter, while waiting for enough parts to build a kw job. If any of you fellows from the East happen to be passing through Sacramento here's an invite to get in touch with George in Dixon, (about 15 miles west of Sacramento).

Bumped into W6PCS in Fresno a week or so ago, and it was good to see there's at least one or two DX men in that locality. PCS has worked 61 countries, post-war including VS7ES, UKØKAA, PZ1RM, EI4A, VQ2GW, PK5LK, PK6HA, VU2LZ, CR9AG, XU4B Mongolia, XZ2. Another DX'er in Fresno but not heard from since the war ended, is W6KUT.

Up Oakland way I ran across W6TI. Incidentally, he has the QSL bureau for this area, so send in your envelopes fellows, and get your DX cards. This probably applies to all QSL bureaus; here and now we might say to send a #10 self-addressed, stamped envelope to your QSL bureau, with your call letters printed in the upper left-hand corner, for quick identification by the QSL Manager. (Think I'll try it myself and see if it works.) W6TI, in spite of hovering over all those choice QSL cards, does get on the air to work some of the stuff himself. From his recent QSO with VS4JH we learned that all contacts will receive a QSL card and for the boys who work him to QSL via R.S.G.B. 6TI's friend, W6TT, also in Oakland, has done a good piece of DX work. Some of his boys include: VS4JH, CR9AG, W1DTS/CT2, VS1QB, VS7ES, ZK1AA, EL4A, I1KN, UA3AO, VP7N, VQ2QW, LA4W, PK6TC, HB9AW, SM5ON, W8SIR/VP9 ZE1GI, OZ7CC.

Across the Bay on the San Francisco side we find W6WN, W6CEM, W6CHE, W6SC, doing their share of DX.

W6AM is now using his new location in Rolling Hills part of the time. In one evening, on 20 meter phone, he worked all continents but South America. Don says he's now putting up a new feed line in order to reverse one of the rhombics into South America.

W6GRL is still knocking 'em off and says UAØKAA is located at North Lat. 73:30, East long. 80 degrees on Dicson Island. You can QSL to him via Box 88, Moscow. I presume this is a QSL Bureau for all Russians, although I wouldn't bank on it. Doc says he has heard three VS7's including VS7AX, 14135; VS7ES, and VS7GR, both on 14065.

W9LIP, Rex Munger, kicks through with a letter from CR9AG and CR9AN. Digging into portions of the letter discloses that before the war their calls were VS6AG and VS6AN, in Hongkong. Up to the middle of July CR9AG had worked about 60 W6's and W7's, one WØ in Missouri, and a few VE7's since the opening of the 20 meter band. CR9AN says the W6's, and a few 7's and 5's break through around 1400 GMT. 6's come through thick as flies and the others between gaps. (What gaps?) He relates some recent screwy conditions . . . the band choked with W6's one night and absolutely dead the next.

Now here is something. You fellows sit up and pay attention. CR9AG and CR9AN are going back to Hongkong one of these days, so if any of you want to work a CR9 you had better get going. For your information the following frequencies are in use by both stations: 14018, 14022, 14030, 14074, 14100, 14120, 14180, and 14200. CR9AN is on 14100 most of the time, with 14022 and 14030 as alternates. Their shacks are approximately ½ mile apart, are on the air regularly from 1330 GMT to 1500 GMT, and lots of the times much earlier . . . about 0900 GMT. CR9AG uses an 807 in the final with 56 watts input. CR9AN uses a 6L6 with 20 watts input, but is building a new rig with an 811 in the final. 9AN's name is Adrian Rosario.

W1JCX, Herb Cole, got back on the air around the first of March, but is ailing of very poor DX. So far he has worked 52 countries on 10 and 20 meter phone. Some of the boys include W9SMA, EP1C, VQ2PL, OQ5AE, ZC2CU, (who has his QRA?), VU8GA, 14140 and 14340, OX1A, W9CAC/TF, and PK4DA. Herb's 20 meter antenna is a 4-element affair only 15 feet off the ground. He uses a pre-war rig with 300 watts into a pair of 54's.

W6FTU, who relaxes evenings operating 20 phone, has worked EA1D, 14340, and D4OOU, 14350, the latter being a former W6.

W1HKK sends through a little info about the New England gang. Seems that W1FH is top man totaling 93 countries then, with 76 on phone. Others in the running include W1IAS, W1AXA, W1LMB, W1CH, and W1HKK, who has 71 countries and 29 zones on phone. The following list has been worked during the month of July by Dana, and maybe the frequencies will help out some of you fellows:

XAAP—Athens	14320	VP2GB (Windward)	14340
VU8GA	14332	EP1C	14320
CE1AR	14120	VE8MM (Baffin I)	14158
I1IY	14330	OX1AA	14330
ZP6AC	14160	SM5UN	14352
ZP2AC	14370	LX1SI	14080
W5HHO/J2	14253	HG2HP	14270
HB9DQ	14010	PZ1A	14310
W9HJW/Saipan	14193	EA1D	14290
VE8MR (Resolution I)	14190	YR5RW	14193
GI5ZY	14325	W9CAC/TF	14158
YN1RA	14138	HP1A	28.67
VP2MY (Leeward)	14360	ZL1HY	28.04
ZC1AR	14390CCO	VK2QR	28.075
PAØJQ	14345	CN8MA	14.300

Again we grab a little stuff from G2MI's column in the R.S.G.B. Bulletin. One thing of interest, BRS 7594, has a card from YI3R, who is operating in Adana, Turkey. Has anyone worked this fellow yet? AC4AB is on the air in Tibet, with 2½ watts. He is Lt. Wells, on leave from Burma. In case any of you chaps worked this AC4 you can QSL to AHQ, R.A.F. Burma, S.E.A.A.F. VS7CX is G2CX and expects to be back home soon. At present he is living in an Indian style house on the beach worrying about the spray from the sea.

In a letter from the Finnish QSL bureau, OH2NQ says their government is now considering the reissuance of licenses. Some Rumanian hams, as yet apparently unlicensed, are however on the air. A few QSL cards have arrived in England from YR stations, YR5X, XQ4BB, PR1AA, YR5USA, and

[*Continued on page 44*]

U H F . . .

By JOSEPHINE CONKLIN, W9SLG
%Conklin Radio Co., 6300 Clarendon Road, Bethesda 14, Maryland

THE WAY THIS SUNSPOT cycle is going, 1946/47 is going to be a fine winter for ten and six meters, with the prospect of six-meter F-layer trans-ocean DX. Already, ionosphere measurements in Okinawa are said to be adequate to support a 2200-mile hop up to a possible 70 megacycles! Here comes your chance, gang, so don't overlook the British on the 58.5/60 mc band from November through February, commencing an hour or so after the first G's come through on ten meters in the morning.

Some interesting contacts appear in the KA1 log of Jim Moulton who has just returned from the Philippines to resume his pre-war call, W3ILD. He used a BC-610 on a rotary beam on ten meters, and found that he could work signals at all hours of the day or night. Usually, midwest and western W's came through in the morning on a bearing around 30 degrees. But he found that at ten to twelve o'clock at night, by pointing his beam north, he could frequently raise an East coast W station with a weak but usable signal. With things like that going on last March, the prospects for 6-meter records this winter are certainly promising.

The six meter sporadic-E layer openings for one or two hops up to around 1200 miles each have been on the wane in August, and little more is expected of them unless they return in December for a month or so as they did before the war. On the other hand, low-atmosphere-bending six-meter DX has been working in the midwest fairly consistently up to 350 and 400 miles from home locations and reasonable antennas. In fact, six meters can do a fine job of replacing the 160-meter c-w and phone band for those willing to use an 829 or better, on a three or four-element horizontal beam which is small enough to require very little in the way of mast or rotating mechanism.

Two-meter contacts up to 100 and 200 miles have also been holding up well, except where one end is in a large city filled with modulated-oscillator transmitters and super-regenerative receivers. In the latter case, stations a few hundred miles away frequently call their heads off at stations near the large city but the latter show no signs of being aware of the DX possibilities.

Six-Meter Skip DX

With the reduction in spring skip openings and reports on six-meter DX, it will not take long to run over the summary of contacts in the last month of the season, as they are given to us.

July 20. W9ALU in Metamora, Illinois, came back on the band to work W1HDQ, W2BYM, W2AMJ and W1LLL.

July 27. Again W9ALU was there to hook W1KUD/1, W1JLK, W1KHL, W2IDZ/2 and W1KMZ/3.

August 1. In a flash opening which lasted only a few minutes, W9ALU contacted W1FJN. W7QAP heard a weak carrier, believed to be WØZJB.

August 2. The band opened at 8:30 a.m. Central time for WØZJB in Gashland, Missouri, for a commercial harmonic of WKR at Brentwood, N. Y., on 51.5 and for a German-speaking broadcast harmonic on 53.6 mc.

August 5. With the ten-meter band open in the evening, an FM station on 49.8 mc came through but there were no amateur signals at WØZJB.

August 8. Again the ten meter band was hot, but only rapidly fading signals were heard at WØZJB, with none identified.

August 9. Twice in an hour and a half in the evening, WØZJB worked W1NWE/4 but heard nothing else.

August 10. The band first opened at 9:30 a.m. at WØZJB with modulated oscillators from Canada unidentified. The East coast broke through at 10:04 and he hooked W2JCR, W1JLK, W2BQK, W1LLL and W1AEP.

August 11. Still better. W7QAP in Tucson, starting at 7:17 p.m. Mountain time contacted WØCHI, WØYUQ, WØJCQ, WØZJB, VE7AEZ, W7HEA, VE7NM, VE7BQ and W7ERA. He also heard WØBJV, W7JPA and W7DYD. Several stations were talking locally for hours on end. Back in Missouri, Vince Dawson hooked some at WØZJB in the morning, hearing W5JGV/7 at 10:20 and working VE4DG in Winnepeg who was using a transceiver. With his beam north at noon, he heard fading carriers and identified WØBJV at Watertown, South Dakota, 425 miles away. Then he heard a station in Washington state. He heard W5JGV/7 again in the evening then worked W7QAP, W6NAW—best signal from W6 so far this year—and heard W6AOR and W6QUK calling VE7AEC in Duncan, B.C. A fading signal was heard from the VE7's direction. The W6's lasted two hours.

August 12. This evening, W7QAP worked W5AJG and heard W5FRD, the latter several times over an hour.

August 14. W7QAP worked W7ERA in the evening.

August 16. W9ALU in Illinois heard W2JCR/1.

August 18. W9ALU heard W4GJO, W4FLH and W4QN, in the morning, indicating that the Florida gang is stirring now. W4GJO came in again in the evening. This might have been a good day, but we have only the one report so far.

Six-Meter Low Atmosphere DX

The Midwest net has been completed from Chicago to Fort Riley, Kansas. Schedules between

[*Continued on page 54*]

Eager Beaver V-H-F Net on FD. Left to right (front row) WØPKD, WØJCQ (rear row) WØICV, WØVWU, and WØYUQ.

The YL's Frequency . . .

by Amelia Black, W1NVP - W20LB

WITH THE FALL SEASON upon us, and ham activities once more in full swing, it might be well to note here the recently elected district chairmen (I mean women) for the YLRL. These are the gals who can give new YL ops info about local YLRL Clubs and other YL activities.

1st District: W1NSA, Beatrice Myer, 487 Essex Ave., Gloucester, Mass.

2nd District: W2NAZ, Lenore Conn, 61 W. 56 St., New York, 19 N. Y.

3rd District: W3AKB, Frances Darne, 1420 Tuckerman St., N. W., Washington 11, D. C.

4th District: W4HWS, Jerry Stock, 317 Boulevard N. E. #22, Atlanta, Ga.

5th District: W5ZA, Eunice Falconi, Box 421, Roswell, New Mexico.

6th District: W6TDL, Clara Dishong, 405 S. Burris Ave., Compton, Calif.

7th District: W7HDS, Lizette Wolf, 3222 Dillon Avenue, Cheyenne, Wyoming.

8th District: W8LSPH, Katherine Henry, 103 Webster St., Hamilton, Ohio.

9th District: W9KSA, Harryette Barker, 103 Prophetstown Rd., Rock Falls, Illinois.

Ø District: WØUA, Loretta Ensor, RFD #3, Olathe, Kansas.

10th District: VE4APA, Maude Phillips, Chancellor, Alberta, Canada.

11th District: G8LY, Constance Hall, N. Walthan Rectory, Basingstoke, Hampshire, England.

Here at W2ESO-W2OLB we're back on 40 now, and between us have been getting some pretty good results, such as HA5F, HH2FE, KL7AB, and several G's, with a borrowed rig running only 35 watts. The transmitter is that little "Watt Squeezer" described in last month's issue by W2KVY, who was gracious enuf to lend it to us. (Thanks, Bob.) The antenna's a 40-meter doublet fed with some Amphenol 75-ohm twin-lead, designed to be as inconspicious as possible to deceive local BCLs. The receiver is a National HRO. Everything is run off a rotary converter—you see, we're in one of those quaint Greenwich Village apartments that still have d.c. Anyway it's an *apartment*, even if we are suffering from 30 days notice to leave. But we're praying for an a-c nest now that we've received official word from the FCC on the return of our old calls.

We were happy to hear from W2NSL the other day. Charlotte and the OM, W2NSA, are living at Spring Lake, New Jersey, and are now active on 10 fone and 20 c.w. They have ambitious plans for getting up a beam shortly. Pre-war, Charlotte operated on 20 c.w. only. She's ex-YLRL Chairman for the second district and was one of the AWVS code instructors during the war.

Curiosity re the closeness of Charlotte's and Mac's calls made us wonder if they had studied for their licenses together. It seems, however, that Mac's ham interest dates back to the old spark days, although he let his license lapse while away at prep and college. The bug rebit him after they were married, and rather than be a radio widow, Charlotte decided she'd better look into this "hamming" herself. Even though she took the FCC exam one week ahead of Mac his NSA arrived first. She's never forgiven the FCC for that!

Little known fact about Charlotte is that she's something of a tennis expert and daughter of the man who founded the Umpire's Association. (Her dad also worked out many of the systems that still govern tournament tennis.) Although Charlotte claims her own playing ability is limited, she's managed to win over thirty small tournaments and has twice reached the West Side Tennis Club finals at Forest Hills.

Recently received a very nice letter from VE2HI, Ethel Pick, of Westmouth, Quebec, near Montreal. She's back on 80 at 3520 and 3530 kc, says she slips from one xtal to the other when troubled with QRM, and doesn't even have to retune the rig. Her xmttr consists of a 42, 807, and a pair of 809s and runs 120 watts. The receiver's an NC 101X; the antenna is 130 ft. center fed.

Ethel also has a rig at her summer place in the Laurentian Mountains. Here she generates her own power to give either a.c. or d.c.; a genemotor is used to run her rig. The receiver there is an SW3. Between runs (in a little English Austin) to this retreat, Ethel teaches sixth grade in a Montreal school.

We're hoping to attend the New Hampshire convention on October 26th, which shindig we understand is always a heap 'o fun. This year a two meter treasure hunt, an emergency net demonstration and many good prizes are scheduled.

Speaking of New Hampshire, W1FTJ, is still snaring DX—reports knocking off EL4A the other night. Dot also got a "heard" card from TF5F in Iceland.

Amending previous reports, Marie W6SPX, *and* the OM, W6RLX (yes, she met him on the air!) expect to be heard shortly on all bands with a new kw rig, using a 125 ft. vertical steel tower. They'll have a four-element beam on 10 and 20, and a sixteen-element on 2 meters. Bet they'll be heard too!

At the present W6SPX-W6RLX are on 20 and 75 fone, and have both fixed and mobile transmitters for 2 and 10 meters. During the last Sweepstakes Marie placed second for California, and sixth for the nation. Before the war Marie operated on 40 c.w., 10 and 160 fone. She was very active on the American Legion Emergency Net and acted as State coordinator in it.

Marie's brother, W6QEU, now back from India, will be on with his own kilowatt rig shortly. (Doesn't anybody in California run only 900 watts?)

Here in New York City more and more new YLs are appearing with calls. W2QGB is Ann Friedman; W2RBU is Ellen White, the XYL of W2QPZ, Bob, ex-W6QEZ.

Ruth, W2OWL, has just returned from a combination vacation and tour of YLs' shacks. She stopped off at Sloansville, New York, to visit 2NAI, who was her code instructor in AWVS days. She found Marge and the OM surrounded by their rig—in pieces—but planning to be back on 80 soon.

Then Ruth visited with 1FTJ in New Hampshire and was properly amazed at Dot's license plate—N. H. 73-88. We'll try to get a pix of that unusual plate to prove it!

OWL is back on 10 fone with a pair of folded dipoles at right angles to each other and is running 100 watts to a T40. She's truly living up to her call, for she can't begin her "hooting" until after the 11 o'clock news. All those complaints from the

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Receiver Sensitivity

CONSIDERABLE INTEREST has been shown recently in methods of measuring and specifying sensitivity of communications receivers. We would like to explain a system for measuring receiver sensitivity which we believe will be accepted as standard by the industry.

First we would like to point out that the term sensitivity encompasses two receiver characteristics, overall gain, and signal to noise ratio.

The sensitivity in terms of overall gain is defined as the input signal required for a given AF power output. It might be expressed as one microvolt input for 50 milliwatts output. This figure becomes meaningless when, as is frequently the case, the receiver gain is sufficient to produce the standard AF power output with no signal input, i.e., from the receiver noise alone.

The sensitivity in terms of signal to noise ratio is the most important performance figure and the one for which there is no generally accepted test. Existing methods for measuring signal to noise ratio become involved in such terms as percentage modulation, receiver band width, audio amplifier response, receiver input impedance, type of dummy antenna, standard reference conditions, methods of making test, etc. Unless all of these items are strictly specified, the results are meaningless.

During the war, a method for measuring the sensitivity of radar receivers came into general use. The method involved a comparison of the signal to noise ratio of the receiver in question with the signal to noise ratio of a perfect receiver under the same conditions. Perhaps, you wonder why the signal to noise ratio of a perfect receiver is not infinite. It would be, except for the thermal agitation noise generated in the radiation resistance of the antenna itself. Thermal agitation noise is the noise voltage generated by the movement of free electrons within any conductor. Its magnitude depends on the resistance of the conductor, the band width of the amplifier used to measure the noise, and the temperature of the conductor. Knowing these factors, its value may be readily calculated.

The resultant sensitivity is expressed as a ratio between the performance of the receiver under test and the performance of the perfect receiver. The performance of the receiver under test is limited by the actual receiver noise while that of the perfect receiver is limited by the thermal noise of the antenna radiation resistance. Since both receivers have the same signal impressed on them, the ratio of their signal to noise ratios is simply the ratio of the actual receiver noise to the thermal noise of the antenna. This figure is called the Noise Factor and is expressed as, say "10db from thermal noise."

The advantages of this method of measuring and expressing sensitivity are obvious. Here are a few:

1. The performance of the entire receiver can be expressed as a single ratio without any qualifying statements.
2. The performance of the receiver can be instantly judged because best obtainable performance figures, up to several thousand megacycles, are known. Also, the receiver is being compared with perfection so the maximum improvement which could possibly be made is always known.
3. Data from various receivers of widely different input impedance, band width, etc., can be compared directly.
4. Performance of a receiver with an entirely new band width, input circuit, etc., can be instantly judged since these factors have no appreciable bearing on the results.

This method of measuring the sensitivity, or noise factor, of a communications receiver is very simple. First the equivalent noise of the receiver is measured. This is the carrier input required to double the noise power output. In a typical case this might be 0.3 microvolt. Then the thermal noise generated in the antenna resistance is calculated. For a receiver with 5KCS band width and 300 ohm input resistance, this is 0.15 microvolt. The receiver in question then has a noise factor of 0.3 divided by 0.15 or 2. This may be expressed as "6db from thermal noise." This example happens to be the performance data taken on the Cardwell Fifty-Four.

The performance of 6db from thermal noise means several things:

1. This is about the best performance obtainable at the present state of the art over the frequency range covered by the Cardwell Fifty-Four.
2. This same performance holds for all positions of selectivity, and for all frequencies within the range.
3. It will *never* be possible to make a receiver more than 6db better than the CR-54. In order to accomplish this 6db improvement over the CR-54 it would be necessary to use noise-free vacuum tubes and have infinite input and interstage coupling resistances. These things are considered impossible at the present state of the art.

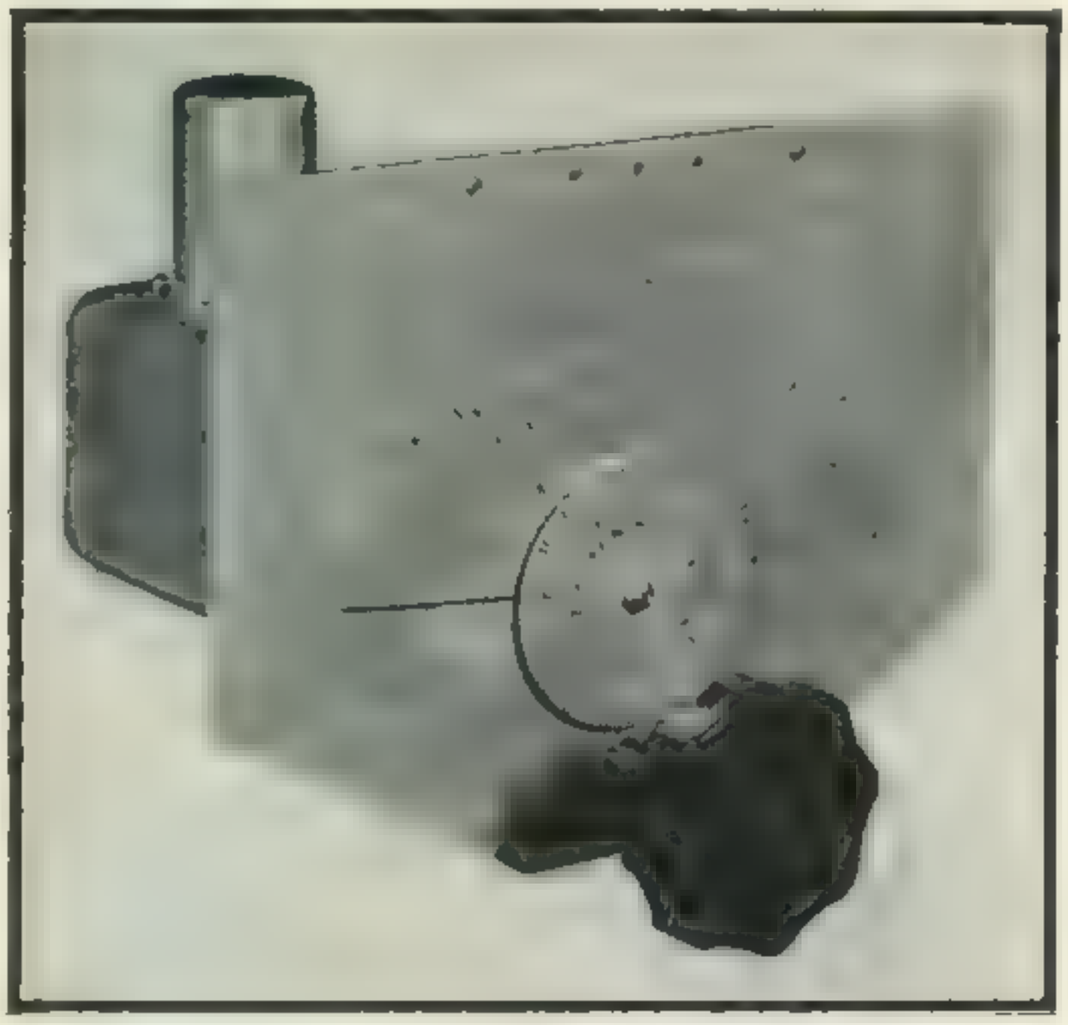
Complete technical bulletin describing the Cardwell Fifty-Four sent on request. Allen D. Cardwell Manufacturing Corporation, 96 Whiting Street, Plainville, Connecticut.

Mack C Jones.

parts & products

Collins V.F.O.

The 70E-8, a new extremely accurate variable frequency oscillator has been announced by Collins Radio Co., Cedar Rapids, Iowa. This v.f.o. has an



overall accuracy and stability within .015%—that is, ½ kc on 80 meters. The oscillator is permeability tuned, and has a linear range of 1600 kc to 2000 kc. Sixteen turns of the vernier dial are required to cover the 400 kc range.

A special corrector mechanism in the oscillator produces the linear calibration curve. Usable output of 10 volts is available from the 6SJ7 oscillator tube for diving an untuned class A r-f stage in an exciter. The output terminal of the v.f.o. can be connected directly to the grid of the untuned stage. One successful circuit has the v.f.o. isolated by a 6AK6 driving a 6AG7. The plate voltage should be around 200 volts to 250 volts d.c. For 10 meter c-w operation, a simple VR tube regulater power supply is recommended to minimize voltage fluctuations.

If only phone operation is desired, the B+ of the oscillator may be opened during receiving periods. Good second, third, and fourth harmonics can be obtained using a 6AG7 tube following the oscillator.

Where higher orders of harmonics are to be used for c.w. operation, it is necessary that extra precautions be taken to prevent reactions from following stages on the frequency of the v.f.o. This reaction is apparent in the form of chirp. It is very desirable from the standpoint of good keying to leave the oscillator running constantly and key the following buffer stages.

Tuning of stages following the oscillator should produce only a very small effect on the oscillator frequency. Frequency changes due to buffer stage tuning can be limited to 5 or 10 cycles at 30 megacycles with proper circuits constant and shielding. As suggested previously, the oscillator can be followed by a small untuned r-f isolating amplifier such as a 6AK6 miniature. This amplifier should be very well shielded. An r-f output of 15 to 18 volts to drive a 6AG7 tube can be obtained with this arrangement. The grid of the 6AG7 and following buffer stages can be keyed by impressing a proper negative bias in order to obtain a good keyed wave shape.

If the oscillator is running at all times, it is well to shield the output lead in order to keep the second harmonic from becoming strong enough to cause interference on a received signal. The shielded lead should be kept reasonably short, say not over 8 inches long. The harmonics are too weak to be bothersome at 7 mc and higher.

Universal Crystal Socket

A universal crystal socket that will take crystal holders with pin spacing of ½", ¾", and others, with small or large pins, is now available. The universal crystal socket is actually a combination 4, 5 and 6 prong tube socket having a total of 9 large and small holes. Designed by W8PME/UNS it is available from Concord Radio Corp.

Transmission Line Spacer

Transmission line spacers designed by W6BY are now available to all amateurs. Fabricated from Amphenol 912-B, a crystal clear, hard, and durable thermoplastic, the Munzig type LX transmission line spacer is light and has a low power factor insuring low loss. The spreader will not discolor from sunlight or outdoor exposure and possesses excellent water and weather resistance.

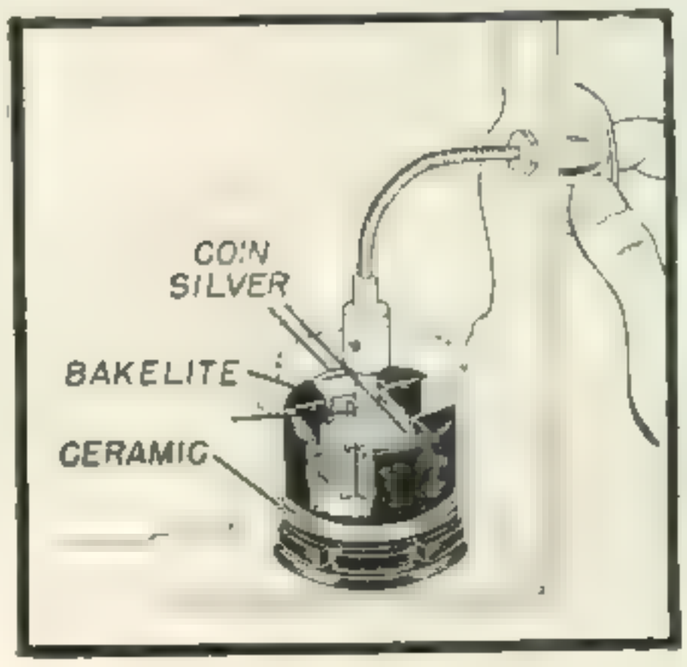
A feature of the Type LX Line Spacer is that it is easily attached to a transmission line without threading wires through holes. There is no metal contact between line wire and spacer to cause noise or changes in line characteristic. The use of tie-wires or set screws in direct contact with line wires may be a contributing cause of unsuspected high noise level. Type LX transmission line spacers are manufactured by the Arthur L. Munzig Manufacturing Co., P.O. Box 863, Redlands, Calif.

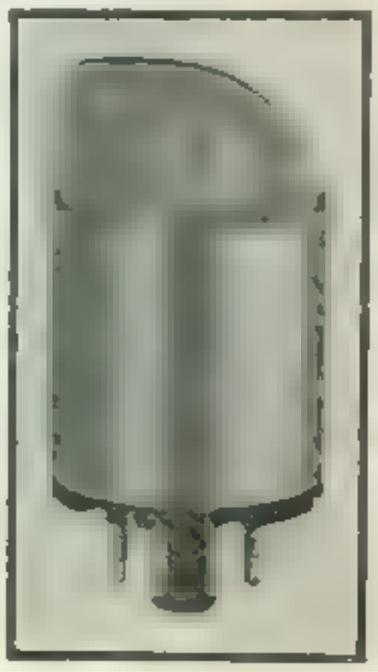
Multiple Crystal Switch

The new X-Trol, a multiple crystal control switch, facilitates the operation of any transmitter on any one of four channels by merely changing the position of the switch.

This compact unit is supplied with four sets of electrodes and springs for mounting four 5 x 5 crystals. A flexible cable accessory is offered to per-

[Continued on page 48]





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New Automatic Noise Silencer
Two Pre-Selector Stages
Turret Band Change
Four Gang Tuning and Band Spread Condensers
Series Parallel Crystal Filter
Calibrated Band Spread
Built-In Crystal Calibrator
Single Signal At All Times
Variable Hi and Lo Pass Audio Filters
550 Kilocycles to 40 Megacycles

The New Improved

KP-81

Receiver

DESIGNED by Karl E. Pierson, creator of the famous PR series of receivers, the new KP-81 is now in production. We promise you this receiver will establish new standards of excellence in the field of radio communications. KP-81 incorporates many of the advanced features born of wartime research, and is years ahead in design, engineering and performance.

We are making every effort to meet the heavy demand for the new KP-81 receivers. However Pierson Electronic Corporation will adhere to their policy of precision construction, and suggest that you place your order well in advance.

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Manufacturers of Communication and Commercial Radio Equipment

Export Department: FRAZER & HANSEN, 301 Clay St., San Francisco, 11, Calif., U. S. A.

CQ DX

[from page 38]

RL1RV are one and the same station. Incidentally QSL via HB9AG.

Jamaica has at last released 28 licenses with a power limit of only 25 watts. The following are now active: VP5AD, 5DX, 5EM, and 5MU. In Barbados a few VP6's are on the air without official authorization. However, VP2AT worked G6CL so maybe things are official at this point. Thanks to G2MI for the above.

W6ANN built a new 20 meter rig using a pair of 4-125A's and has knocked off a few good ones, although still using a long piece of wire for an antenna, about 10 feet off the ground. Bill complains about all the ZL's knocking off Europeans like a bunch of blackbirds, while we sit there and listen.

At last a W4 is heard from . . . W4JV, located in Pensacola, Florida and running 450 watts into a pair of 54's. He has worked 37 countries post-war, admits that this may seem rather low but since no other W4 has reported a thing, it makes him look pretty good at that. 4JV wants to know if we have heard W2GWE passing a lot of hot DX on to our friend, W2IOP, and this reminds him of the old "Tinker to Evers to Chance" combination of the old days. He would like to enter his name as a new candidate, probably to make it triple play.

Cliff McLoud, W9AZT/Ø wants to know if some of the W6's won't lay off so they can have a crack at some of the DX. However, he is not doing so badly in working VS1QB, CR9AG, W4FGW/J2, W4HRP/J3, and W2OAA/J8 on 20 c.w. Also worked a couple on phone . . . W6OCA/J3 and KA1ABA. At present Cliff is using his pre-war rig with a single 35T in the final. He is getting ready to put up a rotary, but right now the antenna is a doublet 30 ft. above ground.

The Federation of Long Island Radio Clubs conducts its tenth annual hamfest at the Commercial House, 96-43 Springfield Blvd., Queens Village, L. I., on October 18 at 8 P.M. Admission by ticket only—at $1.00, Fed. tax included. Net profits to be doled out in prizes for nearly all—entertainment will be supplied by member club "skits." Officers are: Pres. Rudy Ballner, W2BAA; Vice-pres. –Edwin Schabbehar, W2KB; Treas.—William Kunzler, W2AVI; Sec.—Louis H. Roth, W2DKH. Tickets may be obtained from the official clubs, selected radio stores and from Louis H. Roth, 163-18 Jamacia Av., Jamaica, L. I.

The Schenectady annual hamfest is planned for Saturday, October 5, at the 10-01 Club, Scotia, N. Y. Tickets are $3.75 with $.50 extra for late registration. L. M. Leeds, Consultant Engineer, General Electric Co., formerly Consultant to the Secretary of War, will deliver a talk entitled, "New Developments in Super-High Frequency Antennas."

World's Largest
DISTRIBUTOR OF SHORT WAVE RECEIVERS

Do business with the biggest and one of the best in the field. Enter your orders for the following:

Hallicrafters S38 complete	$39.50
Hallicrafters S40 complete	79.50
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Hammarlund HQ-129X complete	173.25
SP-400-SX Super Pro complete	318.00
SP-400-X Super Pro complete	342.00
National NC-46 complete	107.40
HRO Sr, noise silencer, 4 bandspread coils	274.35
National NC-2-40D complete	240.00
National 1-10A	56.10
RME-45 complete	186.00
RME-84 complete	98.70
Pierson KP-81 complete	318.00
RME LF-90	29.70
SCR-221 NEW	86.50
Temco 75GA transmitter	495.00
Panoramic PCA-2 panadaptors	99.75

Prices subject to change.

Delivery of receivers is better. Many models I can ship at once from stock. By dealing with the world's largest distributor of short wave receivers you are assured of the fastest delivery and the best service.

Send your orders now. Trade-ins solicited. You can buy on my 6% terms. I have a large stock of test equipment, amateur transmitters and parts, gov't surplus bargains, etc. Write for lists. Let me know your needs. I will try to give you better service and help. Your inquiries and orders invited. Write, phone, wire or visit either of my stores.

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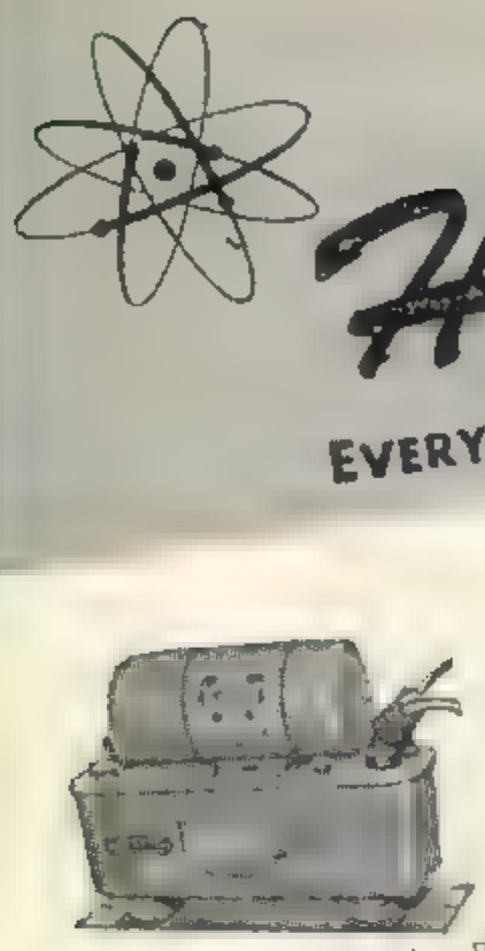


PIONEER GENEMOTOR
High Power on Wheels—

Pioneer Genemotor delivers output 500 V @ 160 mils, input 6 or 12 V—completely filtered —has relays and magnetic circuit breakers in specially constructed casing. The job that will deliver the watts to that mobile rig. Specially priced . . . **$13.95**

PLATE TRANSFORMER

6200 Volt CT-700 mils, 110V. 60 Cy. tapped primary 2 KVA Amertran. A few left at **$39.95**

CONDENSERS

Johnson Variable Condenser, single section, 250 mmf, No. 250H15—1500 V. breakdown spacing .030" **$1.50**

Johnson Variable Condenser, dual section, 200 mmf per section, No. 200FD20—2000 volt breakdown—spacing .045" **$3.45**

Johnson Variable Condenser, dual section, 151 mmf per section No. 150DD70—7000 V. breakdown—spacing .175" **$8.95**

Cardwell Variable Condenser, single mylex insulation, 365 mmf No. MR365BS **$2.95**

Hammarlund type Variable Condenser 20 mmf No. MTC20 . . . . . **$1.15**

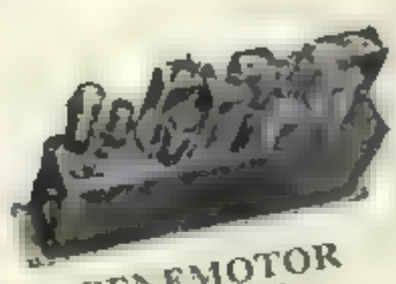
Johnson edgewound **coil**-mylex insulation and mounting, plated, 26 turns at ¼" spacing **$3.95**

Aerovox filter condenser, 1000 mfd. @ 25V. working—perfect cathode filter type No. 804-metal can round with lock washer and nut. **$1.25**

Sangamo No. G1 mica condenser—.011/6000 V. working. **$10.95**

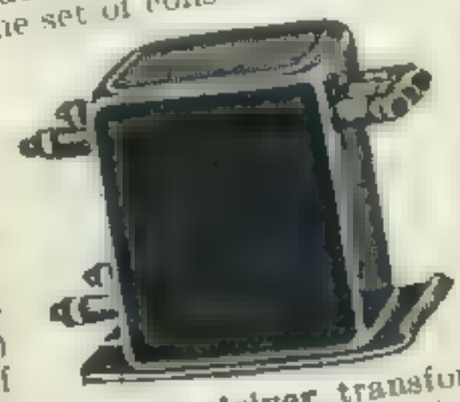
Sangamo No. G2 mica condenser—.003/8000 V. working. **$13.95**

Sangamo bypass condenser **Type H** .003 at 2500 V. working **$0.45**



CW3 RECEIVER

Wilcox CW3 Receiver (used for aircraft monitoring) a fixed freq. receiver (1900 KC to 1650 KC) xtal controlled-superhet with BFO and AC power supply; 110V, 60 Cy—makes a beautiful ham receiver with a converter. Complete with add set of tubes and one set of coils **$32.95**



MODULATION TRANSFORMER

Modulation transformer, perfect for inputs up to 300 watts—150 watts of audio with screen winding. . . . **$4.95**

W. E. driver transformer **Class B** will match any class B grids from 6L6's—Perfect match for above transformer **$3.95**

TRANSFORMERS

Kenyon Plate Transformer, 1450 V. CT @ 420 Mils, 110 V. 60 Cy. primary **$7.95** **Two for $15.00**

Transformer supplying 10V. @ 10 amps 680 V. CT @ 125 M. 6 V. @ 3 amps—A wonderful buy **$2.98**

Tobe filter-mite oil-filled 8-8 mfd @ 600 V. plug-in can PFSC 2 **$1.25**

A. P. C. padders, silver plated with screwdriver adjustments in all sizes from 15 mmf to 75 mmf. Your choice of sizes. **$0.39**

.1 mmf **3500 V. DC** working—perfect for scope round can **$1.93**

Coax chassis feed thru female on both sides **$0.79**

304 TH Eimac, tube brand new, original box. **$9.85**

MISCELLANEOUS

Langevin Swinging Choke—9/60 henries 400/50 mils; DC resistance 72 ohms. . . . $12.75

Antenna change over **relay,** 1 each type 1357 DE-13F-DPDT—plenty of spacing—mounted on low-loss bakelite $2.50

We carry a complete line of **B&W** coils and **Westline Xtals** in stock. Send us your request or ask for catalog. Order today Immediate Delivery. All prices FOB our warehouse N.Y.C., N.Y. Write for our latest Bulletin 9Q. Export Cable Address MICROWAVE—N. Y.

NIAGARA RADIO SUPPLY

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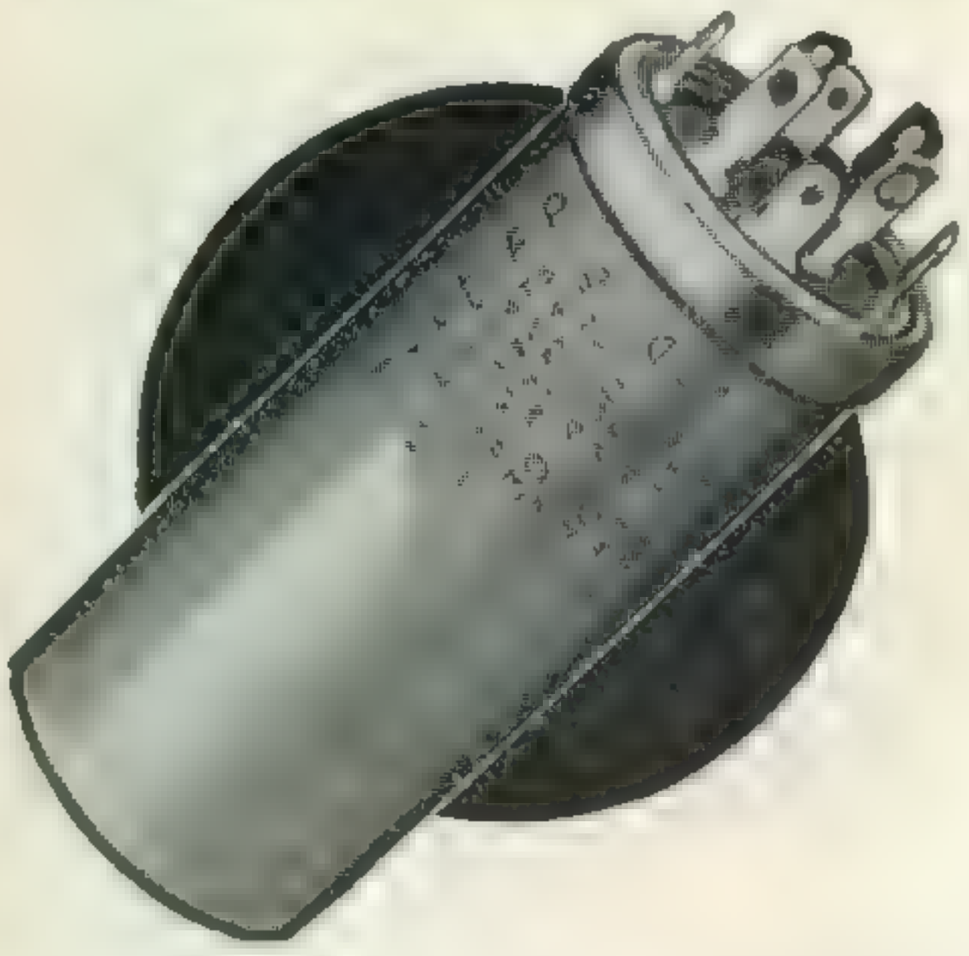
BOwling Green 9-7993

Widely imitated... but still

FIRST CHOICE



Mallory FP (Fabricated Plate) Capacitors have been widely imitated, but when it comes to performance characteristics, they're still the first choice of radio men.

Low R.F. impedance . . . better filtering efficiency . . . surge proof construction . . . smaller sizes without sacrifice of safety or efficiency . . . freedom from corrosion . . . are just a few of the FP features. They explain, among other things, why Mallory FP's are an official standard of the RMA.

Mallory FP Capacitors are available in ratings from 10 mfd. to 3000 mfd., at operating voltages from 10 volts (3000 mfd.) to 450 volts. See your Mallory distributor, or write for the new 1946 Mallory Capacitor Catalog.

P. R. MALLORY & CO., Inc.
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MALLORY

ZEH BOUCK

On August 23rd, Zeh Bouck died. Widely known as a radio writer, editor, and engineer, he organized and was radio operator on the first flight from New York to Bermuda in 1930, and also handled the key on the first land plane to circumnavigate South America. As a radio amateur, his call letters, W8QMR-WLNG, ex-2PI, ex-W4PC, ex-LU4A, were well known throughout the world.

Zeh Bouck was born in New York April 3, 1901, the son of John A. and Alice White Schmidt. He wrote under the pen name of Zeh Bouck, which he later adopted as his legal name. For many years his radio column appeared in the New York Sun, and he was later radio editor of Boys' Life. He was author of three books, "Radio Service Manual," "Manual of Short Wave Radio," and "Making a Living in Radio."

Despite ill health, he gave generously of his time in getting CQ launched. For more than a year, he acted as Associate Editor, helping us through a most difficult period. He was a brilliant writer and editor, and a fine friend. He will be missed by all amateurs.

W9PK has been fooling around on both 6 and 20 and as a result, doesn't have much to report. Some of the boys on 20 include UA3AW, YR5C, VP7N, XAAJ, UA3AF, SM5LK, SM3ZF, HB9DB, PAO-XAD, EI9N, all of them on c. w. 9PK is running 400 watts into a 250TH and for an antenna is using 2 half waves in phase on Europe.

W9ABA worked UA3KAH and UA3AF, both apparently located in Moscow, and wants to know where to send a QSL card. (Maybe a crack at Box 88, Moscow will bring results).

W8YHE is about ready to quit after losing FM8AC half-way through his first DX QSO. Don't give up, Al, it's all in a day's work and part of the game.

W8CVU, who happens to be with the Michigan State Police, has worked CR9AG, plus a flock of European stations which most of us have heard about. Walt is running a pair of 100TH's in the final, and is using some of this 300 ohm line for a radiator as well as a feed line. Says he found the antenna would load better with the feed line 66 feet long. So far W8CVU chalked up 36 countries post-war.

W7AQB reports C1MG as being C. O. Chang of Shanghai. He uses ECO and runs 200 watts to a pair of 812's. Equipment at W7AQB includes a final with 250TH's, 750 watts input, modulated by TZ40's and for the present, a 2 element rotary beam. Receiver is an NC200. Phil has made WAC on phone, and to date his countries total 27.

Well, gang, contributions this month were certainly better than previous months. You boys know it's impossible to put a column together without having something to put in it, so grab pen, pencil, or mil, and dash off a few notes to us. Not only do we look forward to rare DX news, we also want to hear any interesting scuttlebutt re the DX gang, that you might care to pass along. Maybe you can cook up a few station photographs likewise, particularly from some of these foreign stations? See you fellows next month, and in the meantime, perhaps on 20 somewhere down around the third layer. So long for now.

HARRISON HAS IT!

HARRISON HAS IT!

GOOD-BYE TO BATTERY EXPENSE!!

For-
- Portable Receivers
- Transmitters
- Walkie Talkies
- Remote Controls
- Test Equipment

COMPACT!—only 1¾" x 3⅝" x 4" high (6½" high with battery)

LIGHTWEIGHT–3lb., 10oz. Complete.

POWERFUL!—Delivers
- 135 volts at 20 ma in continuous Military service or 30 ma. or more, in intermittent amateur service.
- 67½ volts at 5 to 8 ma.
- 1.5 filament or 6.3 heater, bias, and microphone voltages.

For little more than the cost of *one* set of regular dry batteries, you can obtain a new, modern, rechargeable power pack that will save you space, weight, and money! Ruggedly made for Navy radio equipment, this pack gives excellent service under the roughest field conditions.

RECHARGEABLE POWER PACK

Smooth, dependable power comes from a 6-volt storage battery which clips into bottom of pack and which can be recharged over and over again for only a penny or two. Unbreakable plastic NON-SPILL (even if turned upside-down) CASE. Can give over 6 solid hours of *continuous* operation at full rated load before requiring simple recharge by any half amp. trickle charger or our special inexpensive charger

The vibrator pack has such desirable design features as neon voltage regulator, complete filtering, remote load start relay.

Brand-new, Navy-inspected in original carton with fully charged battery, diagram and instructions. Complete—ready to go ... **$5.50**

STORAGE BATTERY
6 Volt, 3 cell, 30 Watt Hour Storage Battery, as used in pack. 1¾" x 3⅝" x 2½". Hundreds of uses! (Keep spare to use while charging other.) Fully charged, complete.. **$2.**

BATTERY CHARGER
A simple trickle charger for any small storage batteries. Available for 110v AC, 110v DC or 32v DC. Noiseless, efficient, economical. **$2.97**

BC-406 15-TUBE UHF RECEIVERS

Been getting such FB reports from our customers about these swell Signal Corps Radar receivers that we just *had* to get more for you!
Six acorn tube RF circuit, tuned to 205 mc, four IF stages, Thordarson heavy-duty power transformer delivering 350 volts at 145 ma; four choke and oil condenser filters; 115 volt, 60-cycle operation; chassis 10½" x 25½" in metal case. Slightly used but fully guaranteed.

Complete with tubes: 5—954, 1—955, 4—6SK7, 2—6SJ7, 2—6N7, 1—5T4.
Instructions and diagrams for easy conversion to a *hot* 10 (also 6 and 2) meter superhet receiver are included. Parts alone are worth much more than our low HHS Price **$19.98**

VHF GROUND PLANE ANTENNA

Navy Surplus, folding, adjustable, compact. Complete with PL-259 coaxial plug.

A. Elements 17" to 29" with 6 foot RG-58/U coaxial cable. FB for 144 MC . . . **$1.98**

B. Elements 9" to 13" with 10 foot cable. **$1.19**

ABBOTT TR-4B

Harrison has the new, improved version of the most popular 2 meter transmitter-receiver. Now uses Q955 acorn tube for even greater sensitivity and stability. Ideal for mobile or fixed station.
Order yours Now! Immediate Shipment (Tubes $9.18)...**$52.00**

Electronic Labs. new Vibrator Pack #2606. 6 volt DC input. Delivers 300 volts at 100 MA, fully filtered. Compact—efficient!
Complete. . ..**$14.95**

XTALS

Here is the VALUE in ham band xtals that tops anything you have ever seen! Made for the Signal Corps—so they must be good! Fully mounted and sealed crystal for less than the blank alone.
3.5 to 4 Mc in DC-34 Holders.. .. **90c each**
7220 to 7320 Kc in DC-35 Holders . **$1.19**
3.5 to 8.7 Mc in FT-243 Holders (Fits Octal Socket) ....
Specify frequency range when ordering.

COAXIAL CABLE

RG-8/U 52-ohm Impedance. FB for feeding beams, etc. Handles a KW with high efficiency. New, perfect cables.
110 foot length with two PL-259 coaxial plugs. Total list price **$39.28! HSS.. $4.98**
65-foot length with one plug—List **$22.59.** **HSS $3.45**
Cut to size in one piece within –0% to +20% of length ordered. Full measure!

JAN.Type	*Impedance*	*O.D.*	*1-100'*	*100' and up*
RG-8/U	52 Ohms	.405"	9c	6c
RG-11/U	75 Ohms	.405"	10c	7c
RG-13/U	74 Ohms	.420"	14c	10c
RG-39/U	73 Ohms	.312"	11c	8c
RG-58/U	55 Ohms	.195"	8c	5c

MAIL ORDERS? Certainly! Just list everything you want (items in this ad, or any ad, magazine or catalog) and please include full remittance. Immediate shipment! 73 de

Bill Harrison, W2AVA

HAM HEADQUARTERS Since 1925!

HARRISON RADIO CORPORATION

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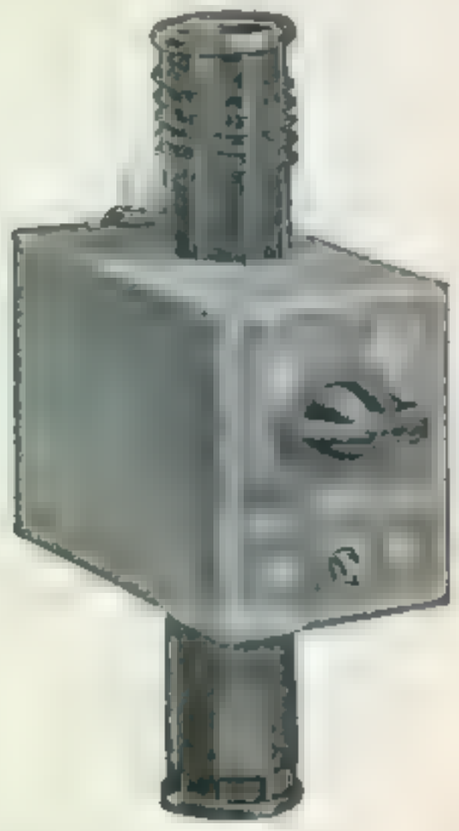
PHONE—BArclay 7-9854 • EXPORT DEPT.—CABLE—"HARRISORAD"

[JAMAICA BRANCH—172-31 Hillside Ave.—REpublic 9-4102]

this shouldn't happen TO YOU!

Why take chances on getting into the wrong band? Today, with frequency multipliers in practically all transmitters, it is too easy to hit the wrong Harmonic. The positive way to tell which band you are on, is by using an absorbtion type wave meter.

The New Bud WM-78 Wavemeter covers all amateur bands from **160 to 5 METERS** . . . accomplishing this by bandswitching. Due to its sensitivity the BUD WM-78 can also be used as a neutralizing indicator.



$6.90 your cost at your radio supply dealer.

BUD

BUD RADIO, INC.

CLEVELAND 3, OHIO

PARTS AND PRODUCTS

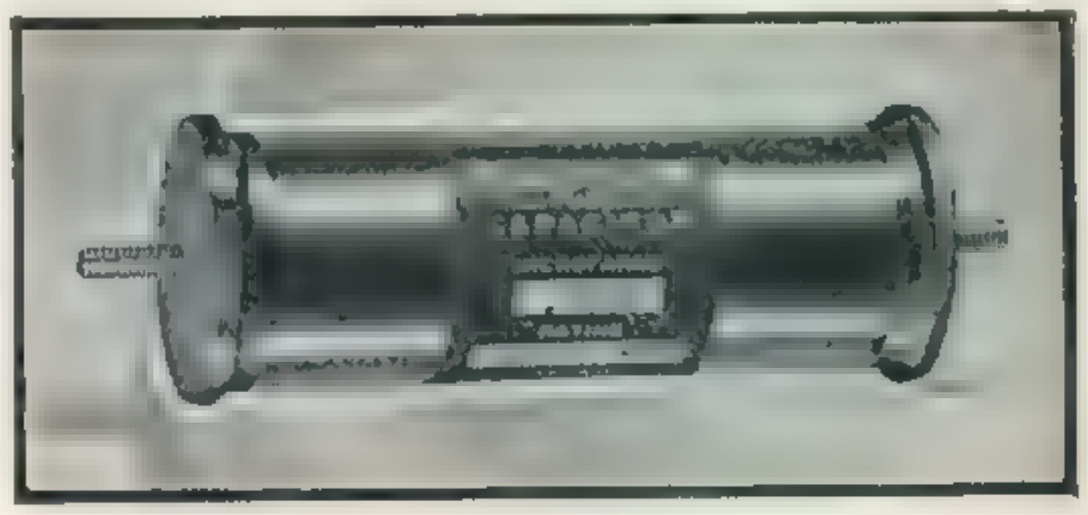
[*from page 42*]

mit panel mounting. The unit mounts in a standard octal socket, height 2⅛" above chassis. The accompanying schematic illustrates the installation in the oscillator circuit. The unit features bakelite, ceramic and metal construction. All contacts are coin silver to insure close tolerance in operation.

X-Trol is designed and manufactured by the Gasket Engineering Company of Kansas City, Missouri.

Plastic Film Capacitors

Condenser Products Co., 1375 North Branch Street, Chicago, Ill. announces two complete lines of Plasticon Glassmikes are now available. Plasti-



cons are plastic film dielectric capacitors in hermetically sealed and metallized glass tubes. Made for working voltages from 600 to over 30,000 volts, Glassmikes are held to 1% tolerance and to an insulation range of 20,000 megohms per μf. Literature is available upon request.

Transmitting Tube Manual

A new 600-page technical manual on electronic transmitting tubes, providing up-to-date information for use by designers of broadcasting and communication equipment and other electronic applications, has been prepared by General Electric Company's Tube Division at Schenectady, N. Y.

The new manual contains photographs, outline drawings, ratings, performance curves, and application data on 94 tube types.

Covering the range of tube types, the new manual furnishes comprehensive application data by describing typical circuits, classes of operation and examples of tube operating conditions. Phasitron and lighthouse tubes are included, along with other developments in the high and ultra-high frequency fields.

The manual has an expander-type binder and has been prepared in looseleaf form with tabbed dividers, for ease of adding new data as it is made available. Provision has been made to supply purchasers with new data as prepared for the manual from time to time for a nominal annual charge.

DX PREDICTIONS

[*from page 36*]

until after 1930 EST. 20 meters from W1, W2 and W3 to W6 and W7 will also stay open longer, probably not closing down until 2400 hours EST. The South and Central Americans will continue to be very strong throughout North America. The MUF from New York City to Rio de Janeiro

"TAB"

That's A Buy

CRYSTALS MTD GUART'D
2 to 10 mc's ACTIVE OSC'S
LOW TEMP DRIFT, each .85
Four for $3.00

DC-9 CRYSTAL 1000KC
VACUUM STD'S.....$5.95

100KC CRYSTAL STD'S 7.20

Raytheon 866A filament transformer 115V 60c pri, 2.5Vct 11A Sec and Two new RCA 866A tubes.....$5.90
With Millen caps and sockets.....$7.00
Raytheon Transformer only.....$3.25

Transformer
High Voltage
new 115V-60 Cy.
Sec 680V.CT 240 MA 1540V no CT 380 MA $4.95 Two for $7.00

WE Tnsf 115V60cy prt-5V26A Sec. 15000V ins.	$4.50
Allied relay BJ 115VAC DPDT 5amp cts new	1.49
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Punched chassis 16 3/4" L x 6"W x 3"H	.35
Punched chassis 16⅛" L x 13"W x 2"H	.65
GE Vacuum condsr 50mfd 16000V	3.95
GE 3 cond tinsel SJ" new rubber cable 100 ft	3.00
Navy sea trunk 12" x 22⅛" x 18" used L N	3.95
Condsr 25 mmfd 10000VAC wkg new 3 for	.75
Dynamic mike unit & inpt trans to grid	1.95
Mallory NF1 Radio noise filter 57c @ 2 for	.98
Basic Strobo flash kit	39.95
Condsr kit qty Silver mica 50 for	2.00
Resistor kit 100 BT 2&1w 50 to 2meg	2.50
Control kit Type AB-J 50 to 1meg ten for	2.50
Johnson 50 watt socket 2 for	1.60
Magnal ceramic socket 49SS11L 3 for	1.00
Diheptal Socket & Adj Ring	1.15
National XC-5 Ceramic 5P socket 4 for	1.00
National No 24 G&P grips ⅜" 25 for	.50
Hvy duty SJ cord set 16 ft. M&F plugs	1.00
GE oil 0.1mfd1500WVDC .65 0.1mfd3000WVDC	1.25
0.1mfd7500W VDC $4.50 0.25mfd3000W VDC	2.95
WE Time delay relay 115V 5 Amp cts 30 sec	1.49

RF Choke UHF 20MH 500 ma	$1.25
RF Choke UHF Hamland 2.5MH 500 ma	.90
RF Choke UHF NAT 1MH-300ma 3 for	.90
RF Keyclick filter 2 Chokes, Condsrs 3 for	1.00
Switch AH&H 10A/125V DPST Rotary	.79
Multi switch 2pole 5pos six deck ($7 39)	1.49
Multi switch 1pole 11pos three Gang ($3 12)	.75
Multi switch 1pole 11pos two Gang ($2 29)	.59
Multi switch 3pole 3pos two Gang ($2 79)	.79
Ceramic switch 3pole 3pos two Gang ($2 95)	.89
Ceramic switch 2pole 5pos two Gang ($2 95)	.89
WE 200 microamps 3½" Rd bkl case	4.95
Simpson One ma 3½" Rd bakelite case	3.00
GR Variac 200 CU New G insp	13.95
GR Variac 50 B New 0-115 230V, 7KW ($116)	90.00
Daven attenuator "L" 5000 ohm 10DB 20 pos	1.45
Daven attenuator "POT" 50000 ohm 60DB 30 pos	5.90
Daven attenuator "T" pad 600 600	4.95
Heineman 0322 magnetic ckt bkr DP 10 amp	2.95
Heineman 0322 magnetic ckt bkr DP 8 & 25 amp	2.95
Acorn new 955 JAN insp	.59
Acorn new RCA 956, 957	1.25
WE 717A Door Knob Tube New	1.95
WE 703A Tube UHF 20 Watt to 1000 mc's	5.95

New W.E. Beachmaster Amplifier Navy Parts	
WE Dynamic microphone Transformer inpt	$2.00
WE Dynamic microphone D-173340A	9.95
WE Dynamic microphone cartridge	3.95
WE 250 Watt Trumpet & 9 Drivers	125.00
WE P.P. inpt & P.P. Driver Transf's (2)	6.95
WE 509 Headset new 8 ft. cord & Plug	3.95

RCA 808 new ($7.75) JAN 200 Watts $2.70 @ 2 for	$5.00
GE 807 new JAN	1.35
GE 446A/2C40 RCA Lighthouse tube	6.95
GE 164J/RK60 FW H.V. Rect.	1.95
RCA 6AC7, new JAN 4 for	3.00
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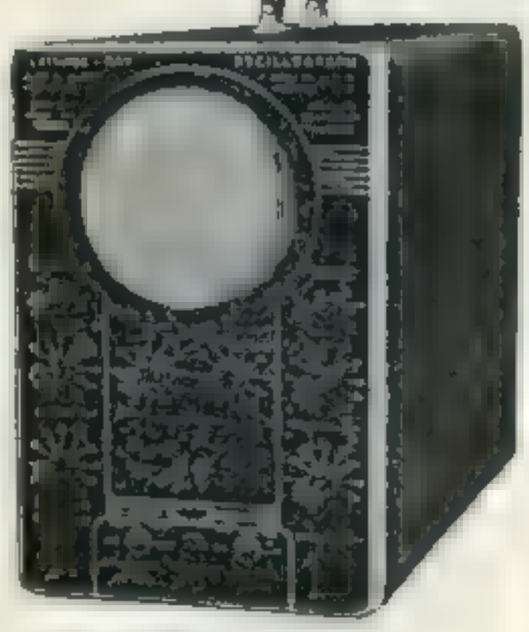

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will be around 40.0 mc at 1500 hours EST. The 10 meter band on this general path will close around 1830 hours EST, with 20 meters staying open till around 0300 hours EST.

With so many stations operating from random spots in the Pacific Ocean, *Fig. 2* has been drawn to illustrate average conditions from Chicago to Tokyo. Very similar conditions apply to W1, W2, W3, W8 and WØ. Although there is no indicated 10 meter opening, it should be remembered that this path crosses a portion of the auroral zone and is subject to many freak short period openings. There is some indication that 20 meters may open around 1900 hours CST, or 2000 EST. Since the northern Pacific conditions are not at their peak, *Fig. 4* illustrates the possibilities in working from WØ, W5 and W9 into the Philippines and South China Sea area. Here we find a very likely 10 meter opening at 1530 hours CST.

Working the southern Trans-Pacific DX is particularly favorable. In *Fig. 3* the conditions from W6-W7 are predicted to VK and ZL. The MUF over this path is expected to exceed 39.0 mc with 10 meters opening gradually from 1100 to 1300 hours PST. But, most important of all, the stations east of the Mississippi River will have an excellent opportunity of working 10 meters on this path from 1630 to 1930 hours EST, with best conditions expected in the last half of that period.

For some time now CQ has been after the Propagation Editor about a good story giving the latest dope on the why's and wherefore's of the ionosphere. The latter party has been holding out until certain secret material was released and more data was obtained from the V-2 rocket sonde experiments, which are at this writing reaching into the F region of the ionosphere. But, at long last, the required data is finally coming through and the stories are under way. Of particular interest to the amateur will be the recent developments in reducing ionosphere measurements from various portions of the world. At one time it was thought that the ionosphere revolved around the earth with only a minor latitude variation. During the war, the excellent coordination of data from the many corners of the globe disproved this hypothesis. It was discovered that in certain global areas, a considerably higher MUF was found than for similar stations of equal latitude a few thousand miles distant. One of these areas will be during the month of October, about 20 degrees north of the Equator and right in the central eastern Pacific area. The MUF in this region is expected to rise to well over 58.0 mc. Between 1500 and 1600 hours PST this formation should be a favorable position to enable a 6 meter contact between Hawaii and stations between

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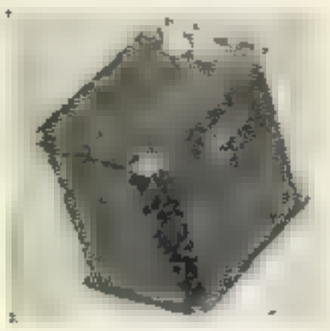

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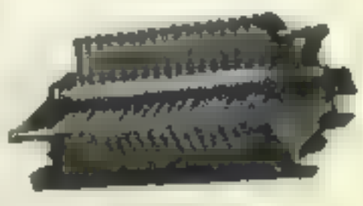

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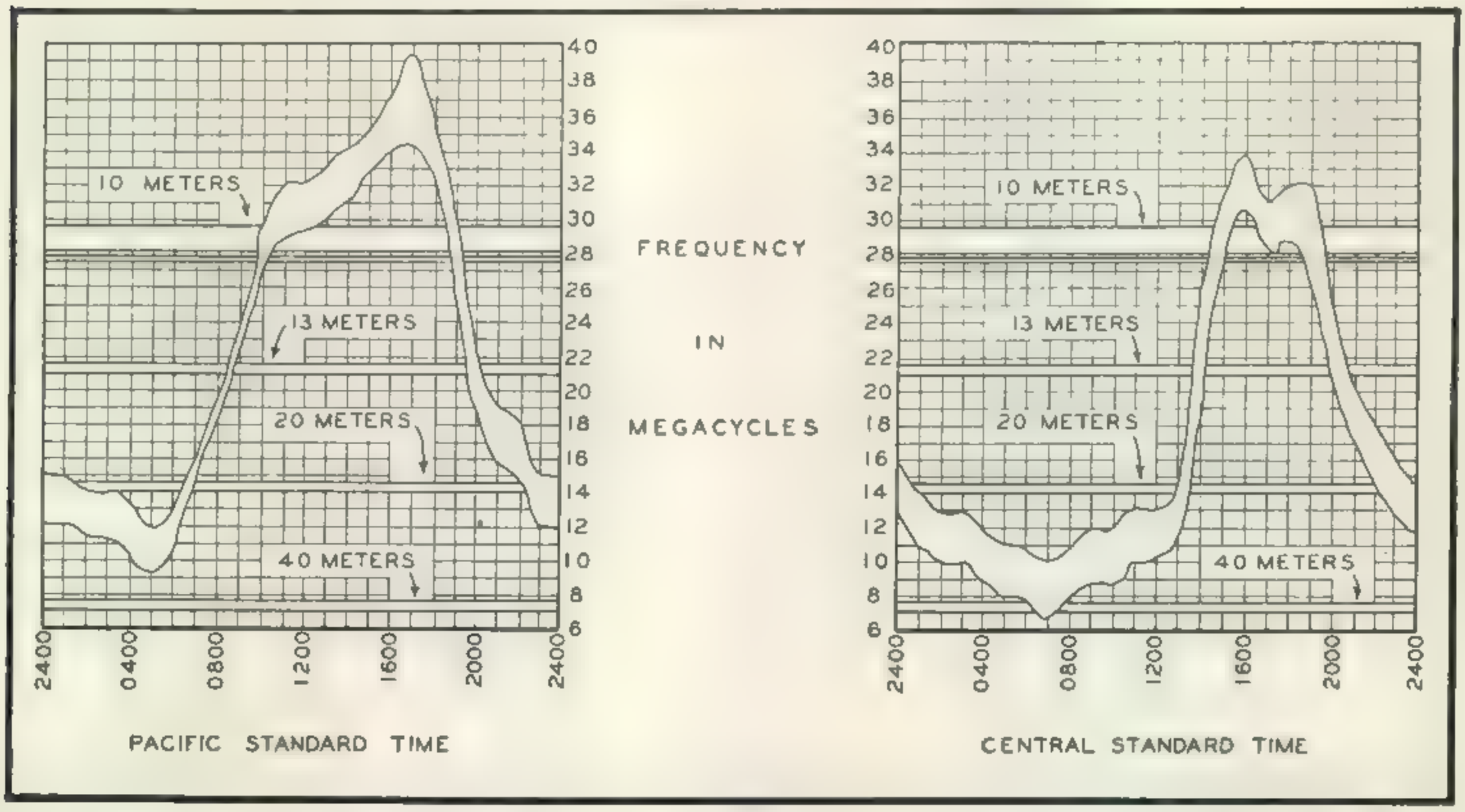

Fig. 3 (left). MUF West Coast to New Zealand and Australia. October 1946 average. Fig. 4 (right). St. Louis area to the Philippines and South China Sea area. October 1946 average.

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YL FREQUENCY

[*from page 40*]

neighbors of course, but at least they prove Ruth *is* getting out!

Conversation on 10 fone lately is really turning the tables on the old days. W2OWL can be heard telling Lillian, W2PMA, that she wishes her OM, Morris, would get his license, and Lil comes back to remark that her OM, Abbey, is already studying code. 2PMA, incidentally, was recently elected secretary of the Metropolitan Amateur Radio Club. The "little woman" is certainly on the air to stay!

YL of the Month - Ruth Brown, W5IZL

Our YL of October, Ruth Brown, W5IZL, is one of those "Three Brown Hams" of Electra, Texas. The other two are the OM, Rube, W5HFS, and the Brown's son, Ernie, W5FYZ.

It started back in 1924, when the OM was W5AWQ, and he and his brother were keeping the rest of the family awake into the wee sma' hours building and trying out equipment. Ruth says, "One night as I lay awake in the next bedroom, I noticed the light blinking, as they tapped out dit-dahs. I practically learned the code that way, and then the 'bug' had me! Instead of going to bed I stayed up with them after that; before long I was licensed as second operator under the OM's call, and operated in this way for several years. But as our children grew older their demands on our time grew greater; we sold all our equipment, and let the license lapse."

However, once a ham–always a ham. Soon elder son Ernie had got the call W5FYZ, and again Ruth

Ernie, Ruth and Ernie's XYL

was back on the air as second operator. When Ernie went to college, the OM, also re-bitten by now, got the call W5HFS.

Poor Ruth was still second operator, and getting pretty tired of it. About this time she got her own call—W5IZL—but still used to sign the OM's call, as she was using his rig—hence his call. Just when she thought she was doomed forever to be "always a second op" the unexpected occurred. Relates, Ruth, "When the rumblings of war started, and we had to prove our citizenship, I got my birth certificate, but the state of Minnesota hadn't started recording births when the OM was born, so he was out of luck. He finally decided it was too much

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trouble and let his call go, so at last the station became W5IZL!"

The Browns have three children. There's Ernie, previously mentioned W5FYZ, a geologist, now married and living in Louisiana. Ruth boasts of two granddaughters—Ernie's little girls.

Bert, another son was a pilot during the war and was in Europe until last October. Daughter, Jean, is now living in California.

Before the war, Ruth worked 20 and 40 c.w., and used to have a regular morning schedule with Guam. She's a member of the A-1 Operator Club with a code speed of 30 wpm.

The Browns' rig consists of a Hallicrafters HT-1 transmitter, operating on 10, 20, and 40; the receiver's a National HRO. They have a three-element beam. As soon as more antennas are put up, Ruth expects to be back on 20 and 40. She's been on 10 fone only post-war and has had nice luck with South Pacific DX, Saipan, Tinian, and Guam. But whether on 10, 20, or 40—Ruth'll be *first* op from here on in!

U H F

(*from page 39*)

WØZJB near Kansas City with W9NFM at Solon, Iowa, 253 miles away, have been R5. Vince also worked W9CHI at Grand Junction, Iowa, 195 miles. WØYUQ at Manhattan, Kansas, heard W9NFM at 353 miles for several nights and then worked him on August 15. Both WØZJB and WØYUQ heard W9QUV at 300 and 400 miles respectively. W9QUV is in Moline, Illinois. After raising his four-element beam from 24 feet to 40 feet, WØZJB continued to hear W9NFM for several nights, but not loud.

To do this work, WØYUQ used one quarter-wave-spaced three-element array mounted directly over another identical one. WØZJB used a four-element beam made of ¾-inch tubing; the radiator is a folded doublet nine feet long, with 8′ 10″ long directors spaced 1′ 10½″. The reflector is spaced 2′ 9″ and is 9′ 8″ long.

The Six-Meter Gang

Frank Lester, W2AMJ, is back both for skip and low-atmosphere DX. Since putting up a four-element horizontal beam, he has been working W1KMZ/3 frequently on six meters and, in the other direction, has been reaching W8CLS/1 and W8CIR/1 around Boston.

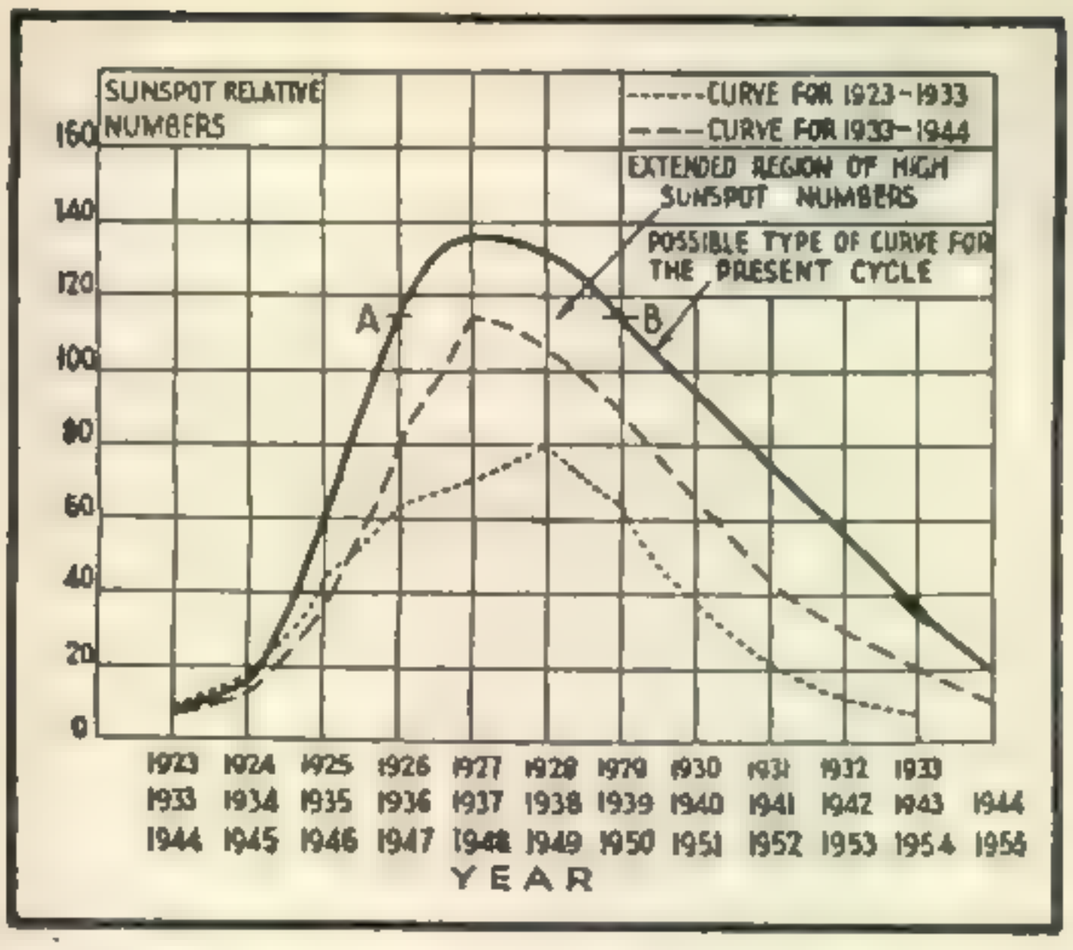
WØJCQ at Fort Riley, Kansas, has been working plenty of DX with six watts on an 807 doubler, and a three-element beam 16 feet high; he also worked WØZJB in Missouri at 130 miles.

W9PK near Chicago has 350 watts and a three-element "W9ZHB" beam. Jack says that there are about sixteen stations active on six meters in the Chicago area.

W2JPX in Larchmont, New York, says that he and W2FID are the Westchester County six-meter stations. Maurice uses horizontal polarization like W2AMJ, W2BQK and W2FID, in order to work first district stations. The skip DX brought out a number of new stations in the metropolitan area of New York, most of them using vertical antennas.

VK5BF told W7ERA that he is on six meters and is looking for USA stations. With the ionosphere data recently recorded, this should become a possible contact, especially for the boys in the Pacific.

The six-meter season found W7ERA using a super-regenerative receiver and 18 watts into an



Predictions of the current sunspot cycle, plotted against sunspot curves for the last two cycles.

HY-75 and four-element antenna. W7AVV has 70 watts on a pair of HK-24Gs and a three-element antenna. W7DDG has a converter working into a BC-312 receiver plus a noise limiter of the HQ-129X type. His transmitter is like the one at W7AVV. W7AMX is also active on the band.

Most of the DX work at W7QAP in Tucson was done with a three-element array using a folded dipole and 300-ohm twin-lead, balanced on a chimney. Bud suffered from a mast-lumber shortage. His transmitter starts with a 16.9 mc 6V6 crystal stage, 6V6 push-pull triplers, and an HK-24G final with only 24 watts input—only three stages for six meters! He uses an acorn r-f stage in his receiver, and a 5000 kc intermediate frequency to eliminate images.

In Bothell, Washington, W7DYD has 75 watts to an 812, feeding a 180-foot long wire antenna. Other activity in the Seattle area includes W7CEC, W7AXS, W7EUI and W7BQX.

Joe Addison, W9PKD, is back on the band in Salina, Kansas.

In Toledo, Ohio, W8JLQ uses a twelve-element Lazy-H antenna, with W9YKX's configuration. It is a Lazy-H with another as director and one more as reflector, at a center height of 40 feet. Because the VE3's cling to verticals, Howard Zeh does not work them. Howard has raised W8OAC across the state in Akron, and W8OMY/3 in Pittsburgh was heard. Other contacts by low-atmosphere bending were with W9QCY in Fort Wayne, and W8SLU at Auburn Heights who uses 450 watts.

In San Pedro, W6ANN put up a four-element beam, and improved his converter with 6AG5 and 6C4 tubes.

The Minneapolis gang have been in on the six-meter DX. W9DWU uses 150 watts on a pair of VT-127As grid modulated, feeding a "W6QLZ" four element beam. W9IFW puts 30 watts on an 815 operating into a folded wire doublet. WØQIN has 150 watts on a pair of 24Gs and also uses a W6QLZ beam. In Anoka, W9DZM/Ø has 30 watts on an 815 feeding a bi-square antenna. W9JHS has 90 watts on a pair of 24Gs, and also uses a bi-square antenna. At St. Cloud, sixty miles north, W9SV has a similar rig; W9HXY puts 30 watts on an 807. W9TOZ runs a kilowatt on a four-element beam. Here are the frequencies:

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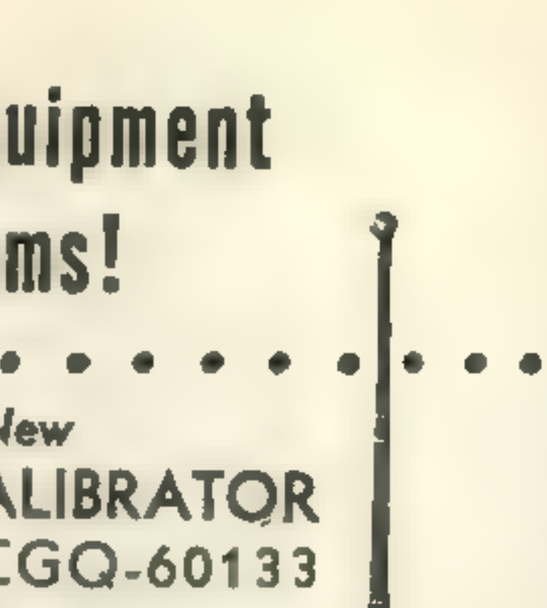

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W9DWU	51.0	W9DZM	50.15
W9IFW	50.4	W9SV	50.06
W9JHS	50.38	W9HXY	51.8
WØQIN	51.2		

An old timer back on six meters is W3BYF in Allentown, Penna. He has 100 watts on an 815 (what, on that little thing?) and an 1851/6K8 converter. He is on 50.04 mc.

The Amarillo, Texas, six meter gang includes W5WX on 50.1, W5HYT on 50.06, and W5HF on 50.08.

Inactivity in the first hop radius has held back contacts at W6OVK. After leaving Arizona and a war-time job with Submarine Signal Company, Jim Brannin settled in Redwood City, south of San Francisco. He was able to work W2BYM for a transcontinental contact on June 14 during a 45-minute two-hop opening; W9HAQ and a couple of other W9s were coming through at the time.

W7CAM has 500 watts on a pair of VT127As, on 50.2 mc.

The Pittsburgh gang includes W8OMY/3, W8RUE/3, W3TFT and W3RNP. OMY runs up to 275 watts on 35Ts, and a three-element beam.

Two-Meter Activity

Here near Washington, D. C., W3GKP is getting out with his 9 watts or so from an 832, feeding an eight-element array with a bedspring reflector. He has worked up to W2AES, if we recall the letters correctly from the conversation we had with Bill Smith at the Washington Radio Club picnic on August 24. He feels that the whole northern New Jersey-New York area is difficult to work because he hears them and doesn't raise them. Partly power, but very likely the crowded modulated-oscillator band up in New York. Bill gets out to W3HWN, and various other points, especially when he hears Baltimore stations 30 miles away fade a bit.

In Patchogue, New York, W2JWO has done very well, working from Cape Cod (W1MNF) to W3QGS in Feasterville, Penna. He has a v.f.o. on about three megacycles, feeding three 6L6 doublers, an 807, an 829 tripler, and a pair of 826s in a neutralized long-lines final. The 826s are triodes built like the 829. The receiver is a converter with 6AK5 r.f. and mixer, 6J6 oscillator.

Lloyd Broderson, W6CLV, mentions quite a few Sacramento, California, hams on two meters including W6GZY, W6MGC, W6KME, W6BVK, W6PIV, W6QKJ, W6MIW and W6QDT. W6BVK with a four-element receiving and 16-element transmitting beam regularly works 125 miles, and hears more than he can work.

There is quite a gang on the band in Detroit, and surrounding area, including W8TBS, W8OCT, W8NJI, W8YDT, W8PZQ, W8GJF, W8MTG, W8UMI, W8URS, W8WXK, W8TQP, W8UKK, W8TYJ and W8YAP. We shall look forward to the results of their contest which ended in the middle of September.

WØZJB and WØYUQ are commencing some two-meter tests out Kansas-Missouri way, and are looking for more candidates in their "eager beaver" net.

W9ZHB in Zearing, Illinois, uses a three-element horizontal antenna about 75 feet high on the two-meter band, fed with 300-ohm twin-lead.

In Pittsburgh, W8OMY/3 uses a pair of 35Ts and a resistance-coupled super-heterodyne. He thinks that the club station, W3KWH, is really fixed up, though, with stabilized transmitter, 16-element beam, and all the fixings.

San Francisco is really active on two meters, according to Jim Brannin, W6OVK. W6QKJ and

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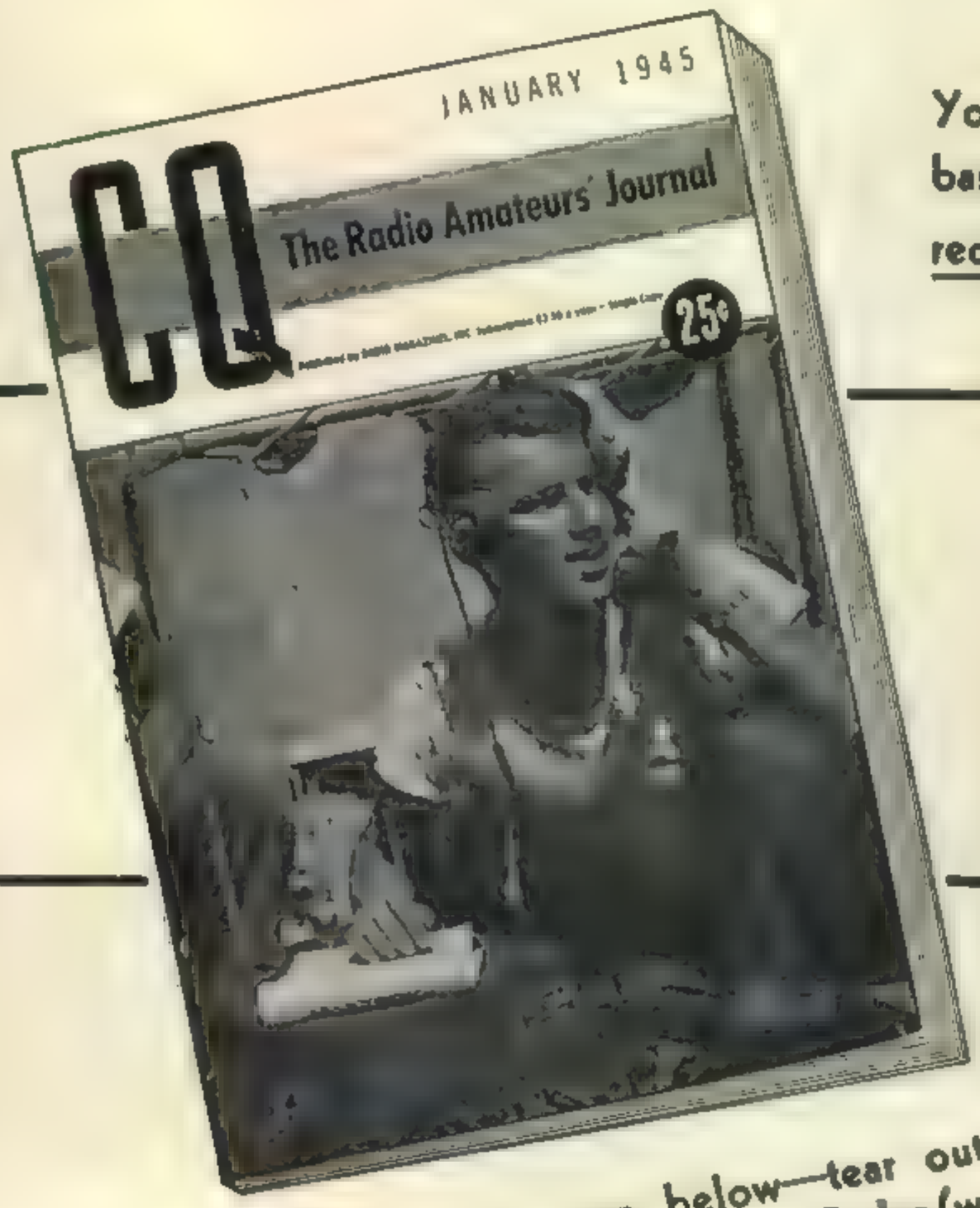

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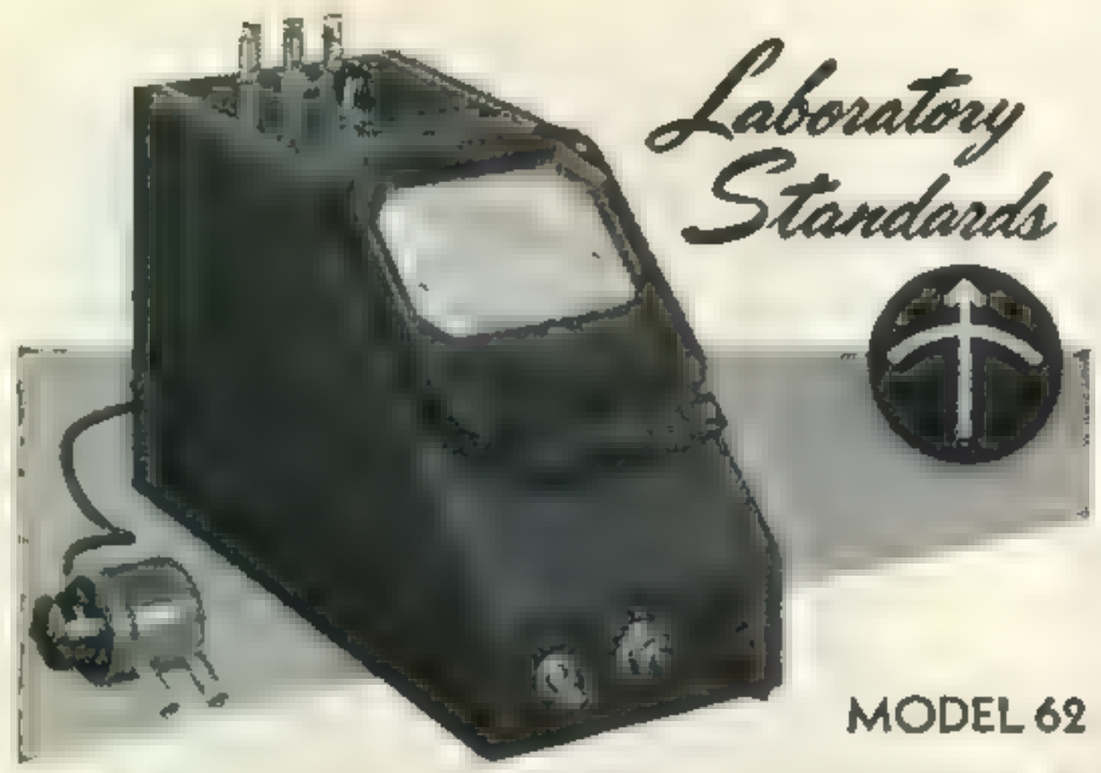

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W6BVK are the high-powered stations, and the latter is a receiver expert too. In the Bay area, W6NNS, W6TCR, W71FL, W6SSN, W6RBQ, W6NJJ and W6EUL are among the crystal-control and super-heterodyne receiver advocates. So is W6LSX in Watsonville. W6NSS heard W6MEL upwards of 400 miles, which is good even in California. Jim uses an 832 tripler and 829 final at W6OVK; when he put up a new beam in place of an extended double-zepp, W6NNS measured the improvement at 45 db—which looks too good for a beam on these frequencies and may be due to the nature of calibration on the S-meter used.

W1JFF says that the boys are finding that crystal-control or MOPA rigs pay large dividends by way of DX worked. He uses a MOPA similar to those at W1LPO in Newport, R. I., and W1KOE—using an RK34 driving an 815 final with 60 watts, and feeding a four-element beam. W1KOE worked W3HWN for a record on this set-up. W3JVV in Maryland was heard on August 6 in between W2s QRM. W1LPO has worked W3GQS in Feasterville, Penna. The New York and New Jersey hop is very easy for most stations in Newport; W1OIK even hooked W2LXO with a TR-4 transceiver, and W1OMC got W2JWO using an HY-75.

The best DX for W3GQS in Feasterville, Penna., is W2VH/1 at Dennis, Mass., about 270 miles. He has worked eight states using a 6C4 oscillator, 6C4 buffer and 829-B final with 75 watts input. W3GQS has a vertically polarized 5-element closely spaced beam fed with 300-ohm twin-lead and has worked 155 stations.

Helen Harris of W8UKS takes us to task for not giving out with more about the Cleveland gang—but she comes through with the dope. Some of the gang are listed below:

W8DVI	Cleveland	W8ML	Garfield Heights
W8FSS	Garfield Heights	W8NIA	Euclid
W1HJ/8	Lakewood	W8NIE	Euclid
W2KDB/8	Bay Village	W8NGW	Cleveland
W8LAM	Cleveland	W8OBG	Cleveland
W8LBJ	Cleveland	W8PAL	Cleveland
W8PXN	Cleveland	W8VVB	Cleveland
W8QJL	Cleveland	W8VVY	Lakewood
W8RCW	Cleveland	W8WDU	University Heights
W8RDZ	Cleveland	W8WJC	Cleveland
W8REL	Cleveland	W8WLW	Cleveland
W8RKG	Cleveland	W8WRJ	Cleveland
W8SUK	Cleveland	W8WSE	Garfield Heights
W8TAI	Cleveland	W8WVD	Cleveland
W8UWF	Clveland	W8YEO	University Heights
W8UXV	Lakewood	W8YGM	Lakewood
W8VDG	Cleveland	W8YIK	Cleveland
W8VJE	Cleveland	W8YJP	Lakewood

The DX stations from W8UKS in Lakewood are as follows:

W8SKG Wickliffe, Ohio	W8TBS Lincoln Park, Mich.
W8SSI Painesville, Ohio	W8TKR Highland Park, Mich.
W8ARF Toledo, Ohio	W8UCT Inkster, Michigan
W8FUR Mt. Clemens, Mich.	W8UMI Highland Park, Mich.
W8GJF Lincoln Park, Mich.	W8WIK Pontiac, Michigan
W8LEC Detroit, Mich.	W8YDT Royal Oak, Mich.
W1MGL/8 Dearborn, Mich.	W8YGG Detroit, Mich.
W8RVI Lincoln Park, Mich.	W8YKE Toledo, Ohio

In addition, W4IFW is airborne and W3GQM is mobile in the Cleveland area.

The band really opened first on July 4th at W8UKS when they called Michigan stations for three hours before the first one was raised, after which there was plenty of contacts. At that time, a vertical antenna was used; since then, however, it was found that others would switch to horizontal so a double square corner beam was erected. Now, Michigan stations are worked nearly every night.

W8JLQ is on two meters in Toledo. Two locals, W8WSX and W8ARF worked Detroit and Cleveland.

SUPER-REFRACTION

[*from page 17*]

ward side of land masses. This is because inland, as we have seen, warm air extends right down to the land-surface during the mornings and afternoons. When this warm dry air drifts out over the cool sea, striking contrasts of temperature and humidity are produced close to the surface. (British experimenters found ducts as low as 25 feet above the surface of the ocean, while most of them were only 75 feet in altitude.) These sharp contrasts are more widespread off shore in the evening, since it takes a few hours for the afternoon air over the land to drift out over the sea. Thus in fine anti-cyclonic weather there is apt to be widespread super-refraction over the sea, most marked to the leeward side of the land masses in the evening.

BEST POLARIZATION

[*from page 29*]

agreement with diffraction theory by a straight edge. Actually this may be extended to transmission beyond the horizon, where the interfering wedge is the curvature of the earth. Experimentally, it has not proven satisfactory, due to the scattered absorption by trees and foliage of vertically polarized waves, at or near the limit of the quasi-optical range. Experiments with atmospheric ducts, on the other hand, indicate that vertically polarized v-h-f signals are propagated to a much greater degree. There is considerable room for polarization experiments by the amateur. Possibly it will be found that a discrete angular polarization may be best, but in any case don't sell either one short, for they both possess certain advantageous inherent characteristics.

Position	Vertical polarization*	Horizontal polarization*	Ratio Vertical to Horizontal Fields	Remarks
1	32,000	31,000	1.03	Position A
2	6,300	4,100	1.54	
3	2,500	950	2.63	
4	1,200	500	2.40	
5	1,080	530	2.04	Position B
6	1,900	1,400	1.36	
7	7,900	8,400	0.94	Position C
8	9,800	11,500	0.85	
9	12,000	19,700	0.61	
10	9,800	17,500	0.56	
11	6,500	9,800	0.66	
12	2,000	2,220	0.90	
13	740	710	1.04	Position D

*In microvolts per meter.

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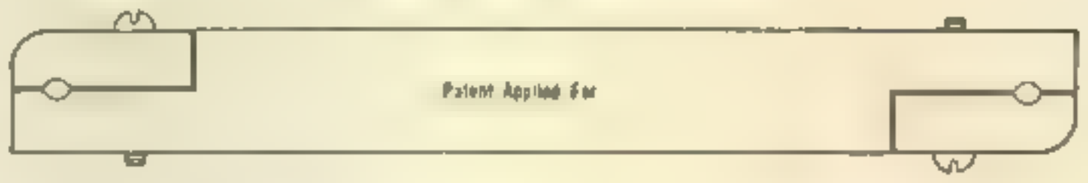

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FM EXCITER

[*from page 32*]

condenser is quarter-way out. Select a microphone having a high impedance and a high output, such as a crystal mike with an output of approximately –48 db. It will be observed that when the LC tank circuit *L1* is tuned to resonance with the crystal plugged in, the deviation will be very small. In order to adjust this tank circuit, proceed as follows. Having the gain control on full and speaking into the mike, the receiver set to the 10-meter output frequency, adjust *C1* for maximum audio. If the frequency should suddenly jump, the lock between the crystal and the LC tank has been broken. The audio sounding as if it had 60 cycles superimposed on it, is another indication that the lock between the crystal and the LC tank is broken. If this condition exists, back off a little on *C1* to a point where quite a variation of this condenser doesn't make much difference in the frequency. This adjustment once made need not be repeated unless shifting frequency. Now, shut the a.v.c. off in the receiver, plug in a crystal microphone or other high-impedance type, and turn the gain control on full. Speaking about two inches from the mike in a normal tone of voice the modulation should sound somewhat fuzzy. By detuning the receiver slightly to either side of the carrier, the quality should clear up and sound similar to an AM signal.

Link Coupling To The Main Transmitter

The majority of the transmitters operating ten meters use 40-meter crystals. To connect the FM modulator remove the crystal and substitute a coil and condenser that will tune the 40-meter band. Put two or three turns around the cold end of the coil, and link couple to the FM adaptor, tuning the plate circuit of the oscillator to 20

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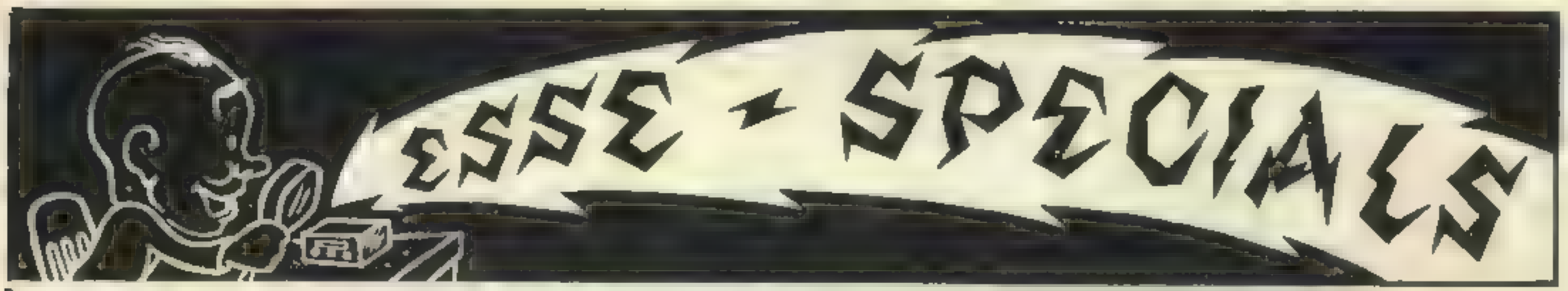

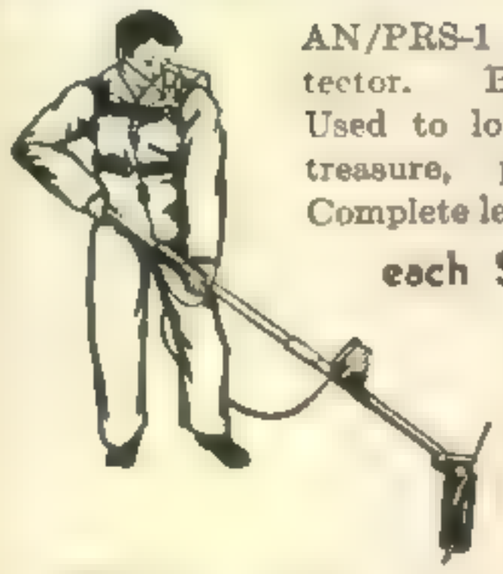

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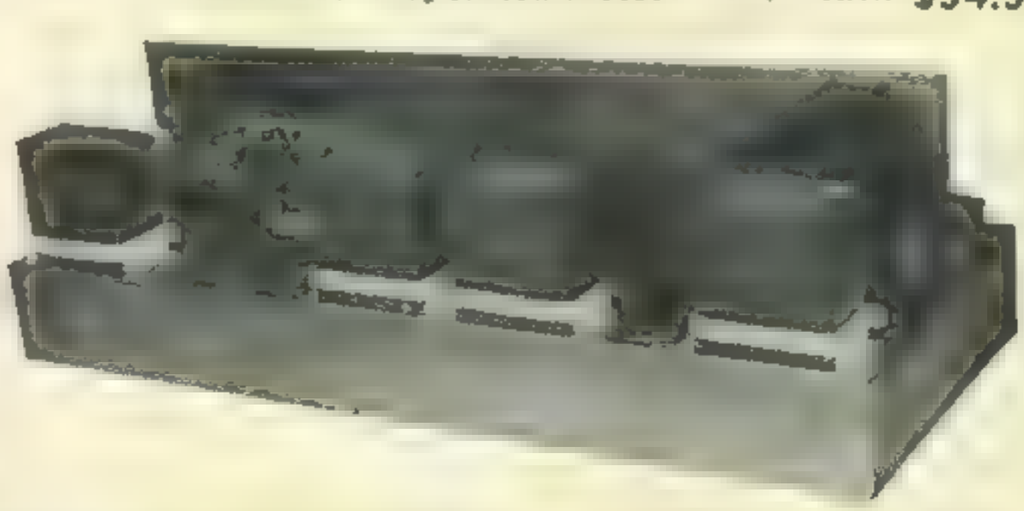

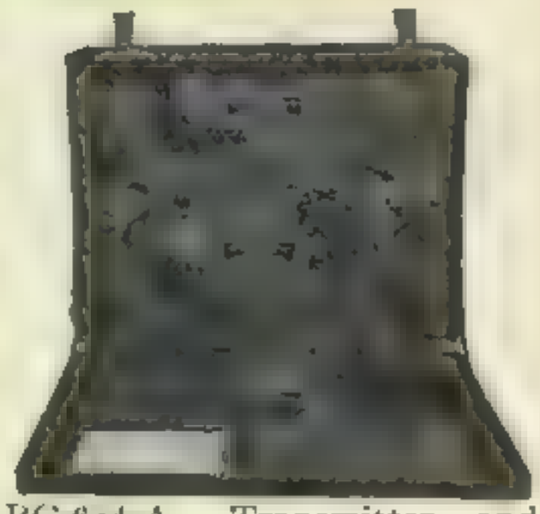

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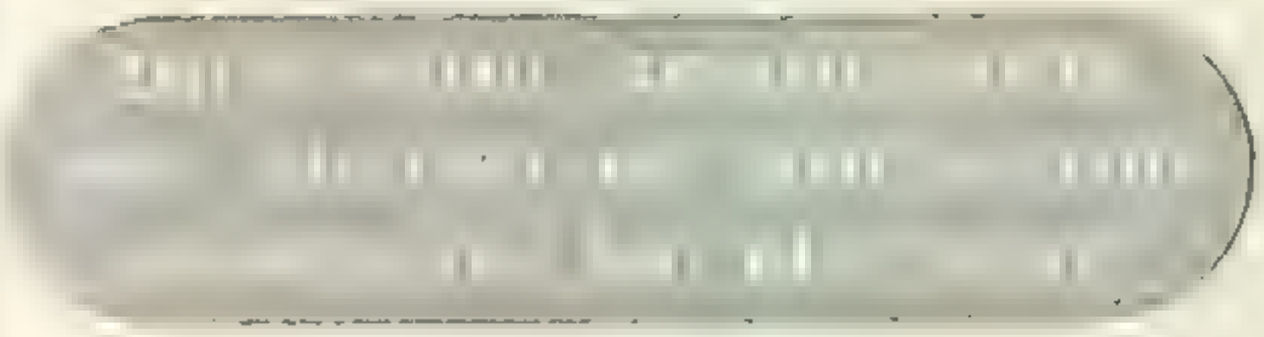

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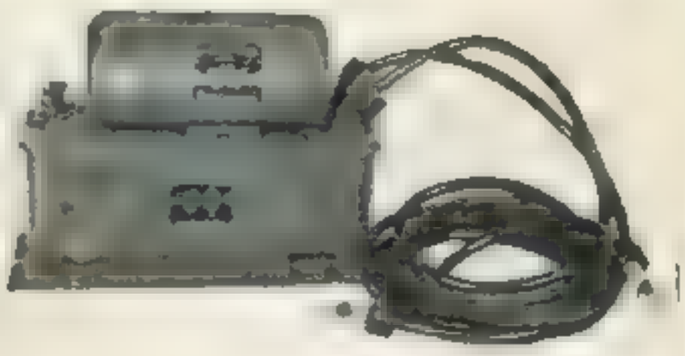

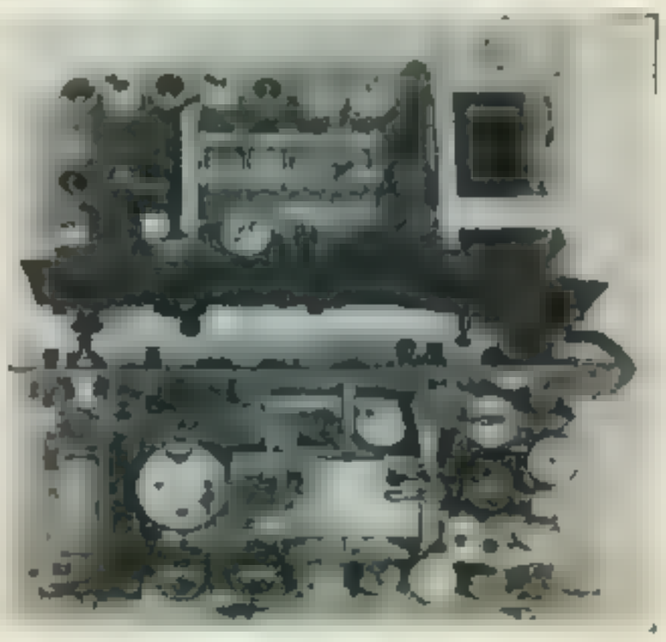

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Also available is a dynamotor unit PE-103, which was designed especially for this equipment. It operates from 6 or 12 volts DC and delivers 500V at 160MA. Its base contains filters, circuit-breakers, switches, and relays necessary for operation, and it comes complete with input cables.

The price of transmitter-receiver unit is $39.95 including crystal and 13 tubes. A dynamotor if desired is $19.95. Both units purchased together, $54.95. Shipping weight is 50 lbs. and a minimum deposit of 25% is required on all C. O. D. orders.

meters. The crystal oscillator stage is now a doubler. Since most crystal oscillators use either pentodes or beam tubes, no trouble should be encountered. The output should feed another doubler to ten meters. The tuning up of the transmitter remains the same as when the crystal was used.

If a tri-tet oscillator circuit is employed, make sure that the cathode coil is shorted out. It is advisable to place a d-c milliammeter in the grid of the crystal oscillator when used as a doubler to simplify the tuning. The r-f output from this FM adaptor is more than adequate to drive any pentode or beam tube operating as a doubler.

To work the new 6-meter band, select a crystal having a frequency between 2,200 kc to 2,250 kc and tune the 6V6GT multiplier plate to the third harmonic of the crystal, making this stage a tripler. The allocation of FM on this band is from 32.5 mc to 54 mc. When operating on ten or eleven meters, the FM adaptor is capable of deviating up to 3 kc with the audio gain wide open, making normal operations of approximately 6kc swing. When working on the 6-meter band, the gain control should be set to approximately a quarter of the way open for a 6 kc swing. When operating the 6-meter band the crystal frequency is being multiplied 32 times, which also doubles the deviation as compared to ten meters.

Operating On The Air

When working a station it is important that the a.v.c. in the receiver should be shut off and if the receiver has a selectivity switch, it should be set in the sharp position. Tune off to either side of the carrier where the audio sounds the best. No difficulty should be encountered at the receiving end.

When placing the narrow band FM adaptor into operation it is possible to operate the Class C final amplifier stage at its maximum Class C telegraphy characteristic, giving more output and better efficiency which cannot be done when AM modulation is used.

Conclusion

The author will be thankful for comments from those who build this unit, especially from the hams who have severe cases of BCI. I want to express my appreciation to W2EEG, W2ALH, W2CTP, W2BJ and others who have permitted me to hook up this FM adaptor to their transmitters to actually demonstrate the advantages of narrow band FM.

In a subsequent issue of CQ Magazine a simple inexpensive FM detector that can be hooked up to any standard AM receiver to produce true noise-free reception will be described.

[1] Narrow Band FM for Amateur Use, CQ, March, 1946
[2] Narrow Band FM Transmitter for 10, CQ, April, 1946

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D4AAB

FIRST YL IN GERMANY

HILDA ANDREW, W4HWR, from Skyland, N. C., near Asheville, is now D4AAB of Wiesbaden, Germany, and is the first and only licensed YL in the American zone of occupation in Germany, out of more than 350 amateurs listed in the entire area.

D4AAB, who just arrived in Germany this past May, was lucky to get this call, which was the second to be issued in the zone. The Captain who had originally held the call left for home just before Hilda arrived, and the licensing officer gave it to her, as the first YL to apply. She's especially amused at the OM's chagrin at being down the line with D4AIW—despite his nearly twenty years as a ham to her five!

The OM, incidentally, is Lt. Col. J. D. Andrew, staff Chaplain for the U. S. Air Forces in Europe.

Hilda's being thoroughly spoiled for any local QSO'ing in the future by the amount of DX she's now hearing and working. She says a sample page of her log reads like this: SM5YS, ZS1CZ, PY1GJ, F8PA, G2ACT, XACP, GI6TK, EI9J, OZ2LX, LA2OA, UA2KAE, I1AZ, 1AE (He was on a ship off the Norwegian coast), YRQ, and TA1DB. She seems to be heard best in this country in New England, and contacted most of the New England states, as well as England, Ireland, Scotland, France, Italy, Greece, Sweden, Africa, Brazil, Sicily, and Denmark, during her first month of operating.

Hilda Andrew, W4HWR, operating D4AAB

Their radio equipment consists of two transmitters, a 500 watt Signal Corps BC 610 for fone and c.w. and a 60 watt home-made 10 meter rig. Their receiver is an SX-28. So far the only antenna's a half-wave doublet, fed with coaxial cable, but they have hopes of putting up a beam shortly. The problem is where to put it, for the entire yard space is filled with fruit trees and a vegetable garden. They're afraid it's going to end up in the vegetable garden because they can't put in on the slate roof.

We asked Hilda to describe their quarters and the living conditions. She wrote, "All the wives were very pleasantly surprised with our homes here. None of us had any idea what we were getting into. Here in Wiesbaden we live in a community of about 85 houses, all enclosed with wire, a gate with guard at the entrance. It is not much different from living

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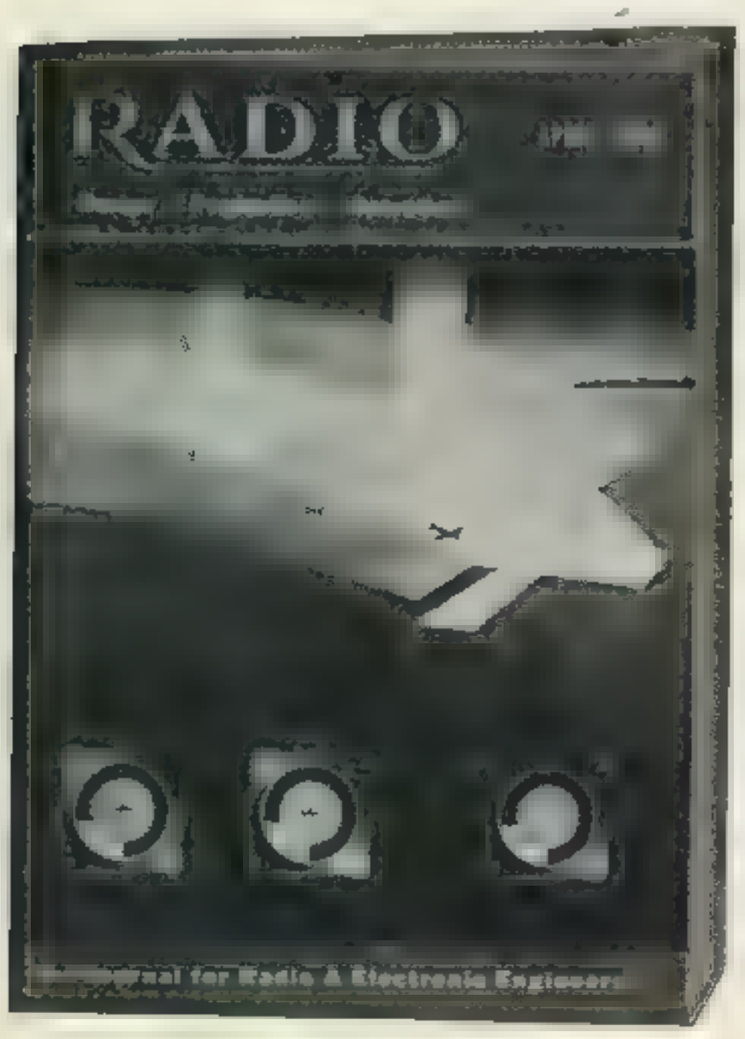

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RADIO MAGAZINES, Inc., 342 Madison Ave., N.Y.C.

on an Army Base back home. The houses are large; most houses over here are. We have three floors. The shack is on the top floor in a room which has windows on two sides. It looks like a control tower and makes a wonderful radio room.

We buy our food in the Army commissary and are able to get the essentials; in fact, I get more meat than I was able to get at home. The commissary has no fresh vegetables or fruit and no fresh milk. However, we have a wonderful garden at home and will feel the pinch until winter. In an area no larger than 50′ by 100′ we have the house, flower garden, vegetable garden—plus apple trees, pear trees, apricot, cherry and plum.

Hilda is particularly fortunate in being stationed in Wiesbaden, which was strictly a resort before the War, so naturally has facilities for all sports, along with a beautiful club the Americans have taken over.

Hilda, who speaks no German, said their cook speaks no English, and when the Andrews first arrived, they never knew 'till they came to the table what they were going to eat.

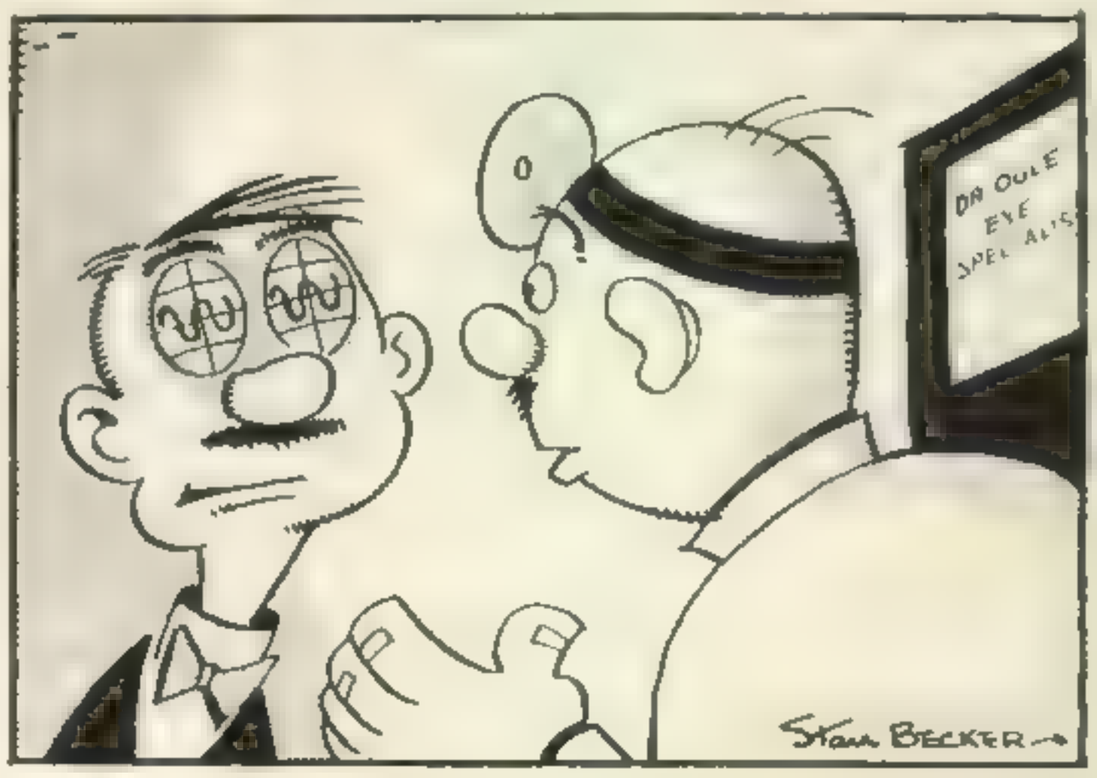
Prior to her marriage Hilda was a physical education director. She became interested in ham radio in 1939, when she married Chaplain Andrew. Apparently it was a case of promising to "love, honor, and become a ham!"

When 20 opened on July first at 2 a. m., the Andrews went on and stayed on until 5, hearing and working more strange calls than Hilda even knew existed, but without hearing a single W. Since then she's worked a number, and has been deluged with requests from USAEF personnel and their dependents, who want to contact their friends in the states. Hilda's glad to do anything she can to help, and says to look for her on 14,240 kc, most any time.

ZERO BIAS

[*from page 5*]

tion. It is a strong temptation—lots of things in life are—but if a DX station is worth your license, go right ahead. Most monitoring stations are manned by hams, and they know a good DX catch just as quickly as you do. It is only an infinitesimal minority that practices such operating habits, but these cheats do none of us any good—besides sending our blood pressure up when they snag the DX. Watch your frequency carefully, keep your FCC files clean, and rest assured that these habitual violators of the rules and regulations will end up behind the well-known eight ball.



ALL AMATEUR TRANSMITTER CONTEST RESULTS

AFTER MORE THAN three months of diligent study, the judges of the 1st All-Amateur Transmitter Contest have announced the winners. The first prize in the 250-watt transmitter class goes to Jay C. Boyd, W6PRM, 3276 DeWitt Drive, Los Angeles, California. The winner in the kilowatt transmitter class is T. E. Atherstone, W7IV, 1921 Dover Street, Denver, Colorado.

Mr. Boyd, 42 years old, has been a member of the ARRL for the past 22 years. He is a bachelor and is employed as a printer by the Los Angeles Evening Herald Express. During the war, he served as a radar instructor in the Signal Corps with the rank of sergeant. Boyd wins $1,125.00 face value in savings bonds, as well as a complete transmitter built to his winning specifications, by Taylor Tubes, Inc.

The judges agree that his entry not only won the low-powered class, but was the outstanding entry of the entire contest. It is expected that plans and pictures of both winning entries will be made public as soon as the units have been built.

Atherstone, winner in the kilowatt class, is 36 years old and married. He has been a ham since the age of 6 years, and is employed in the engineering department of radio station KFEL at Denver. He was a radio engineer with Maguire Industries in Greenwich, Conn. during the war. In addition to his Class A amateur radio license, Atherstone holds radiotelephone first and radiotelegraph second-class licenses. Strangely, he has only operated up to 300 watts power heretofore. Atherstone receives $1,000.00 in savings bonds (face value) and his prize-winning entry built for him, entirely free, by Taylor Tubes, Inc.

While the contest was inaugurated by Taylor Tubes, Inc., Chicago, nine other radio parts manufacturers participated, donating prize bonds totaling $2,125.00. The participating manufacturers are: Aerovox Corp., New Bedford, Mass.; American Phenolic Corp., Chicago, Ill.; Barker & Williamson, Upper Darby, Pa.; Bliley Electric Co., Erie, Pa.; Gothard Manufacturing Co., Springfield, Ill.; International Resistance Co., Philadelphia, Pa.; E. F. Johnson Co., Waseca, Minn.; Solar Manufacturing Corp., New York, N. Y., and United Transformer Corp., New York, N. Y.

The judges in the contest were: Fred Schnell, W9UZ, (Chief of Radio Dept., Chicago, Police) Oliver Read, W9ETI, (Editor, *Radio News*,) Cyrus T. Reed, W9AA, (Radio Buyer, Montgomery Ward & Co.), John Potts, (Editor, *CQ* and *Radio*), Lewis Winner, (Editor, *Communications*), Frank Hajek, W9ECA, (President, Taylor Tubes, Inc.), Rex Munger, W9LIP, (Sales Manager, Taylor Tubes, Inc.) and Karl A. Kopetzky, W9QEA, (Pres., The Signet Corp.)

The contest was managed by Magazines, Incorporated, 188 West Randolph St., Chicago, Ill.

A bigger and better 2nd All-Amateur Transmitter Contest is planned for the winter of 1947. It is expected to increase the number of prizes and open the contest for wider manufacturer participation.

144 MC BEAM

[*from page 13*]

represents the beam antenna of eight half waves in phase with reflectors just described. This array has a power ratio of approximately 31 to 1, or on converting to db, a forward gain of 16 db.

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Often the value of antenna gain in db appears small, but upon calculation it will be seen that this corresponds to a kilowatt transmitter using a dipole antenna and a 30 watt transmitter using the eight half waves. One can hardly believe that a few pieces of copper tubing placed in the correct positions could do so much.

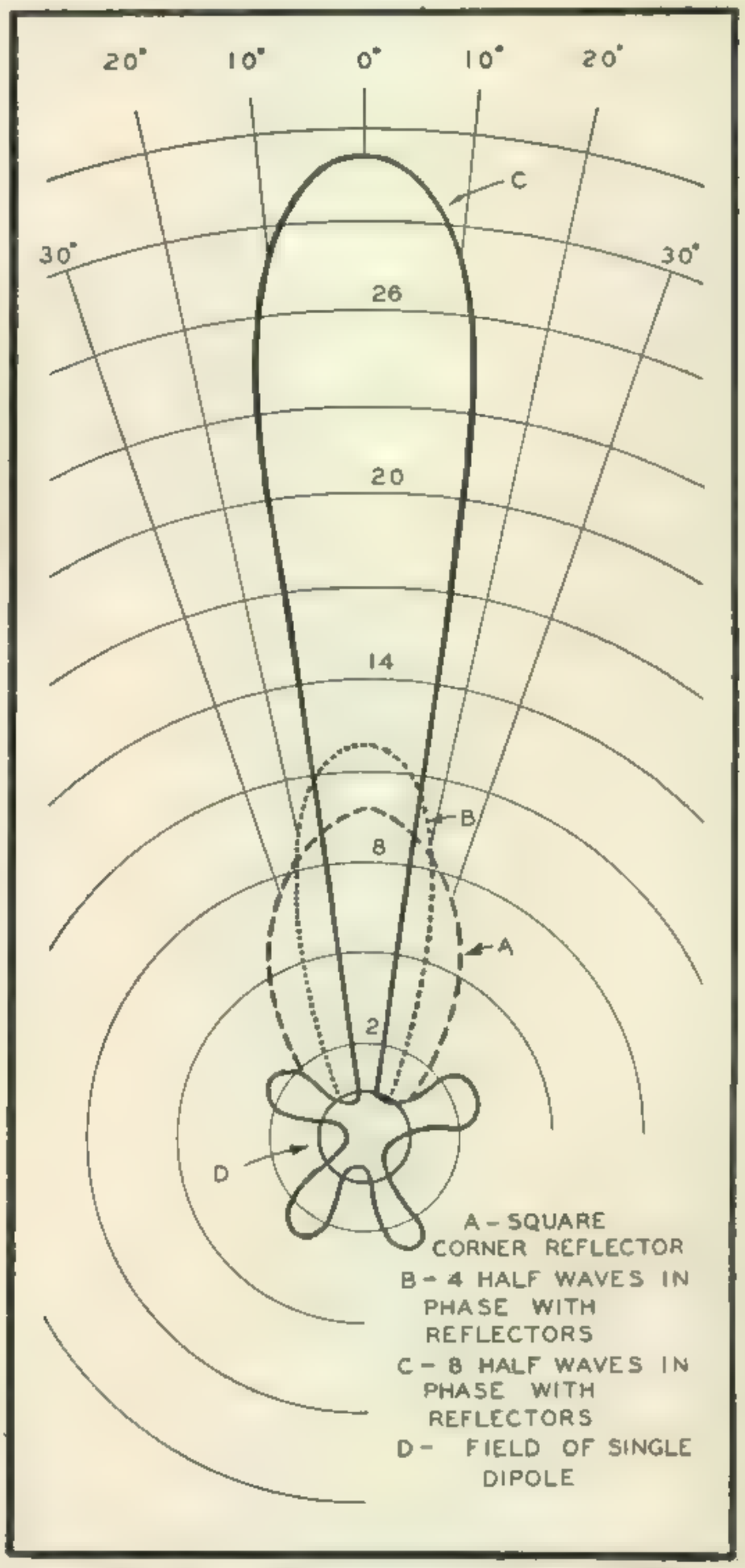

Fig. 4. Field strength measurements taken on different antenna. All arrays were mounted at same height and measured with same equipment.

The results using this array at W3HWN have been very gratifying with a number of contacts over the 200 mile mark and quite a few in the 175 mile bracket with R9 plus reports. On receiving, the array has been particularly valuable with several stations around 300 miles distant being heard. The writer wishes to thank W3GEJ for his assistance in taking the field measurements and Mr. Ryesky, who took the pictures.

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Advertising in this section must pertain to amateur radio activities. Rates: 20c per word per insertion for commercial advertisments; 5c per word for non-commercial advertisements by bona fide amateurs. Remittance in full must accompany copy. No agency or term or cash discounts allowed. No display or special typographical ad setups allowed. "CQ" does not guarantee any product or service advertised in the Classified Section. Closing date for ads is the 1st of the month preceding publication date.

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FOR SALE: NC-44 with speaker. Excellent condition. $35. E. Newman, W2RPZ, 214 Munro Blvd., Gibson, L. I., N. Y.

FOR SALE: Collins 32B, 25W, Serial B1018 phone and CW transmitter complete with coils and tubes. A fine job for the beginner. First $75 takes it. Box 511, Wakefield, Rhode Island.

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QSL's .... Samples for Stamp .. Henry L. Carter, Jr. ... W2RSW, 747 S. Plymouth, Rochester 8, N. Y.

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RADIO TUBES, Parts, Condensers Free bargain lists. Potter, 1314 McGee, Kansas City 6, Mo.

RECEIVERS: New RME-45, RME-84, VHF-152, DB-20, NC-240D, HRO, HQ-129X, Super-pro, Hallicrafters. Panadaptors. Temco transmitters. Roto-Beams $195.00. Conklin Radio, Bethesda, Maryland.

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Commencing with the NOVEMBER, 1946 issue the rate for commercial classified ads will be 25c per word. There will be no change in the non-commercial rate.

PORTABLE C-W RIG

[from page 27]

ity of performance and adequacy of rating.

The entire r-f portion was wired carefully and with all possible precaution against dislocation of either wiring or components. R-F wiring was done with short direct leads, firmly soldered in place. D.C. and audio wiring was laid in to provide a maximum of sturdiness and reliability. Components were secured by nuts and bolts and with lockwashers. Small components such as resistors and capacitors were mounted with both ends tied down. Larger items were clamped or bolted into place. Stranded wire, amply insulated, was used for connections, and a good solder job was done on all joints. After the wiring was completed and tested, plenty of "lockstitch" was applied to hold the wires in place in cable form and well lashed down.

The justifiability of these precautions is shown by the lack of any mechanical or electrical failure of any joint or component in over 5500 miles of automobile travel, plus the large number of "set-ups" made during that time. The only failure has been that of a 7 mc crystal that gave up the ghost—naturally, it was during a QSO!

Power Package

The power supply unit was formed when the already complete vibrator pack was fastened onto a one-inch board of adequate size, and when a small metal panel was installed in front of the pack. This panel holds the socket, *S2*, and the power switch, *SW3*, (a heavy-duty Cutler-Hammer toggle with a bat handle having a luminous dot in its end. That dot helps find the switch in the dark!) The two heavy leads shown in *Fig. 1C* connect to a large male Jones plug, *P3*, which in turn connects to the female Jones cable socket, *S3*, permanently connected to leads brought out through a 15-ampere fuse from the car's storage battery under the front seat.

The car frame is *not* used as one side of the power circuit. However, all gear is wired so that the *grounded* side is the "cold" or "negative side" of any circuit. Since the vibrator pack is completely filtered, both as to the primary and output circuits, only a suitable connector was required to complete the circuit to the r-f package. This was supplied by a four-prong tube socket. *S2*. and its associated plug, made from a tube base, *P2*, which, in turn is connected by a cable to the female Jones cable socket, *S1*. Two three-foot leads are brought out of this cable socket, *S1*, and connected to the key which may then be

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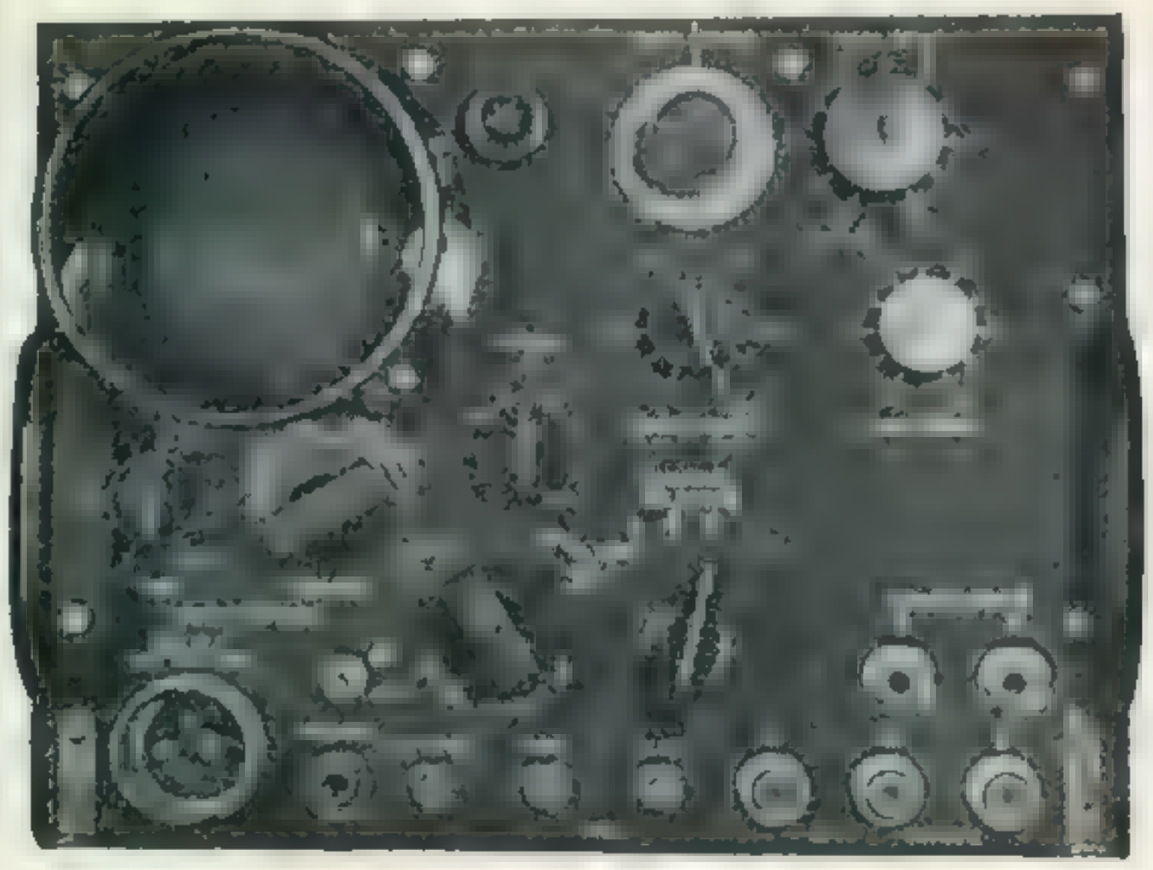

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G.E. 814 Pair **$11.45.**
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BC 406 receivers 205 mc 15 tube with 10 meter and broadcast FM conversion instructions. Final clearance price with 2 spare 954 tubes **$19.50.**
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Wilcox limiter amplifiers type M57D1 less tubes brand new **$37.50.** Put one in your 600 ohm speech line and increase your effective transmitter efficiency 3DB.
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placed on the knee or on any suitable support. The key, a war-surplus, J-38, is fastened to a small piece of aluminum together with an r-f key-filter. This filter removes any possibility of BCI and also improves the keying characteristics.

Operation and Adjustment

Actual adjustment of the transmitter is comparatively simple and easy. Usually, a long wire is erected so as to have from 75 to 100 feet in the clear and as high as feasible. (This is a lot *harder* than it sounds.) An insulated lead-in is connected. The r-f unit is placed either on the running board, or on the back of the car's front seat. The interconnecting cables are put into place and the antenna connected. The power unit is connected to the battery terminal socket and the filaments heated. After applying the power, capacitors *C18* and *C19* are juggled until resonance is indicated by the glow of the neon bulb. If an additional check is desired an external antenna current device (consisting of a 6 volt 250 ma bulb) is placed in the antenna lead. Tuning of the two tank capacitors is continued until maximum antenna current is obtained and then the bulb is either shorted out or removed from the circuit and the antenna connected to its post.

Operation on the 3.5 mc band is accomplished by the use of crystals for that band. Operation on the 7 mc band is obtained from either 3.5 or 7 mc band crystals, and on 14 mc the second harmonic of suitable 7 mc crystals is utilized. The desired ten watts is secured on all bands. The keying is good under almost any combination of tuning, on the 3.5 and 7 mc bands but on the 14 mc band careful adjustment is required to avoid the possibility of a chirpy note. Slight underloading of the plate circuit will result in an improved 14 mc signal. Break-in operation is possible if two separate antennas are provided. The detector tube blocks, but will clear in a short time, permitting break-in if desired.

Operation of the receiver is normal and satisfactory. By pulling out the amplifier tube, the plate tank coil, and after disconnecting the receiver antenna lead, a sufficiently weak signal from the crystal oscillator may be obtained for satisfactory calibration on the ham bands. By logging the settings of *C2* and *C3*, repeat calibration, within fairly close limits, may be obtained. If "dead spots" occur when a long antenna is connected, a series capacity may be inserted in the receiver antenna lead, or a different length antenna may be used.

Overall operation of the portable gear has proven satisfactory, within the limits of the transmitter power, the antenna systems and the receiver characteristics.

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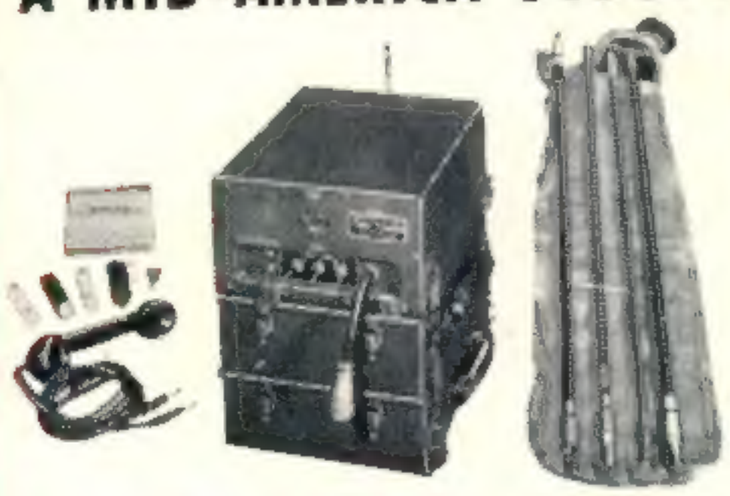

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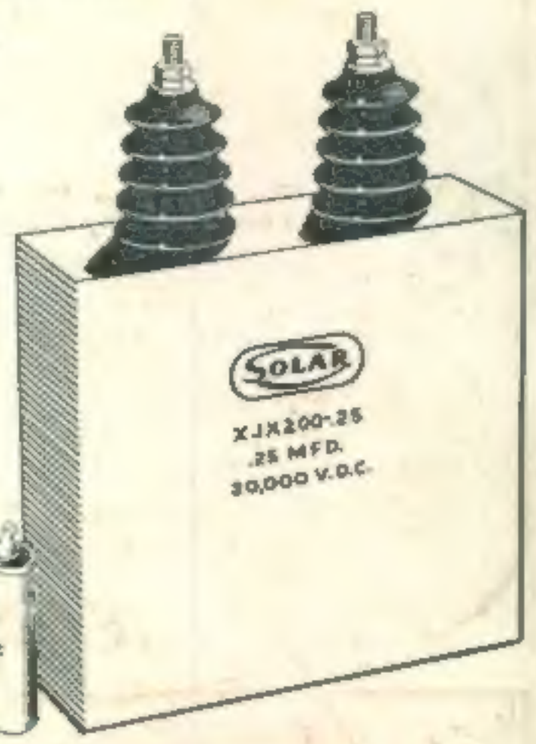

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